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VOLP (P.). **Some effects of leaf-scald disease in the Mulgrave area.**—*Proc. Qd Soc. Sug. Cane Technol., 1948*, pp. 171–174, 1948.

Contrary to the view held by some growers in Queensland, sugar-cane leaf scald [*Xanthomonas albilineans*: *R.A.M.*, xxvi, p. 563; xxvii, p. 96], if not kept under control may assume grave proportions and cause heavy financial loss. Of the six chief cane varieties grown at Mulgrave for the 1947 crop, concern was felt chiefly for the susceptible varieties Q 44 and Trojan, second and fourth in importance, respectively.

Regular inspections in a field of Trojan in the wet part of the Mulgrave area at the end of May, 1947, disclosed 7 per cent. diseased stools, with patches containing up to 30 per cent. By early July, visible infection had fallen to 3 per cent. over the field and to 12 to 15 per cent. in the bad patches. At the end of September, six stools, previously showing a single streak each now appeared to be healthy. On 7th November, plantings were made from the stools as follows: A, 8 plants from three stalks with disease symptoms; B, 11 plants from three apparently healthy stalks from stools showing symptoms; C, 11 plants from three stalks from which the symptoms had disappeared; and D, 11 plants from three apparently healthy stalks from stools of vanished symptoms. The stalks in B and D had never shown symptoms. On 8th December, in lots A, B, C, D, respectively, 8, 2, 2, and 2 plants were found with leaf-scald symptoms.

In July, 1946, a grower planted a block of river flat country with Q 44 taken from a field showing 7 per cent. leaf scald, but 75 per cent. infection resulted in the crop at harvest, accompanied by a heavy loss in sugar-content and tonnage.

CAMP (W. H.), RICKETT (H. W.), & WEATHERBY (C. A.). **International Rules of Botanical Nomenclature.**—Reprinted from *Brittonia*, vi, pp. 1–120, 1947 by Chronica Botanica Co., 1948. $3.50.

After two pages of preface the writers present a text of the International Rules compiled from the official Rules and from the Proceedings of the sixth International Botanical Congress at Amsterdam, 1935. Although this text is unofficial, it must be practically identical with an official text, if and when one is published giving the changes made in 1935. Since the official Rules covered only the alterations made in 1930, and since they have long been unobtainable, all botanists will welcome this book.

BUCHWALD (N. F.). **Sclerotiniaceae Daniae. En floristisk-systematisk Oversigt over di i Danmark fundne Knoldbægersvampe I. Del. Ciboria, Rutstroemia, Myriosclerotinia g.n. og Sclerotinia.** [Sclerotiniaceae of Denmark. A floristic-systematic survey of the sclerotial cup fungi found in Denmark. Part I. *Ciboria*, *Rutstroemia*, *Myriosclerotinia* n.g., and *Sclerotinia*.]—*Friesia*, iii, 4, pp. 235–330, 33 figs., 1947.

This critically annotated survey of four genera of the Danish Sclerotiniaceae (the first since Lind's Danish Fungi, published in 1913) [cf. *R.A.M.*, xxv, p. 235]

comprises ten species of *Ciboria*, four of *Rutstroemia*, five of *Myriosclerotinia* n.g., and six of *Sclerotinia*.

Mention may be made of *C. alni* (O. Rostr.) n.comb. (*S. alni*) and *C.* (*S.*) *betulae* [ibid., iv, p. 199; xix, p. 735], contaminants of alder and birch seed, respectively; *S. gladioli*, first observed on *Gladiolus* corms in Denmark in 1928 and isolated in 1943 by P. Neergaard (*in litt.*) from *Freesia* root-collars; *S. trifoliorum* on clover and other Leguminosae [ibid., xxvii, p. 365]; and *S. sclerotiorum*, known to occur on 32 different species of plants in Denmark, where its most frequent hosts include beet, *Brassica campestris rapifera* [colza], *B. napus rapifera* [rape], caraway, melon, cucumber, carrot, sunflower, tomato, and bean (*Phaseolus vulgaris*).

All the species of *Myriosclerotinia* known in Denmark are parasitic on Cyperaceae and Juncaceae, the type species being *M.* (*S.*) *scirpicola* on *Scirpus lacustris*. The genus differs from *Sclerotinia* proper in its microconidia, which are of the *Myrioconium* type.

Greene (H. C.). **Notes on Wisconsin parasitic fungi. X.**—*Amer. Midl. Nat.*, xxxix, 2, pp. 444–456, 1948.

Continuing his annotated list of Wisconsin parasitic fungi [cf. *R.A.M.*, xxv, p. 365] with species collected during 1947, the author records *Colletotrichum phlogina* Fairm. as a doubtful parasite of *Phlox divaricata*, *Stagonospora meliloti* (Lasch) Petr. on the giant white Ladino clover (*Trifolium repens*), and *Septoria gaillardiae*, not previously noted in the State, on *Gaillardia pulchella* var. *picta* [ibid., xxvii, p. 186]. Many of the spores of the last-named fungus were found to be shorter than 45 μ and rarely over 50 μ.

Bottomley (A. M.). **Gasteromycetes of South Africa.**—*Bothalia*, iv, 3, pp. 473–810, 79 pl., 1948.

In this comprehensive study the author assembles records and descriptions of all the species of Gasteromycetes known in South Africa, using G. H. Cunningham's classification system and keys [*R.A.M.*, xxvi, p. 127].

Chiu (W. F.). **The Boletes of Yunnan.**—*Mycologia*, xl, 2, pp. 199–231, 1948.

This is an annotated list of 54 species and two varieties of Boletaceae (including 22 new species and one new variety) collected, for the most part, in Yunnan, south-western China.

Kuhnholtz-Lordat (M.). **Notes de pathologie végétale. (Suite.)** [Plant pathological notes. (Continuation.)]—*Ann. Epiphyt.*, N.S., xiii, pp. 43–55, 14 figs., 1947. (*Sér. Path. vég., Mém.* 1.)

In this further series of plant pathological notes [cf. *R.A.M.*, xxvi, p. 155] the author describes *Septoria cornina* n.sp. on *Cornus sanguinea* in the South-west of France, differing from *S. cornicola* in its longer conidia which often reach 48 μ in length, taper at the extremity, and are conspicuously curved, while those of *S. cornicola* are not over 40 μ long, relatively thick, cylindrical-sinuous, and rarely curved.

The author's collections of *Cercospora smilacis* made in summer at Montpellier from *Smilax aspera* had straight or slightly curved conidia 70 to 95 by 3 to 4 μ with 8 to 10 septa, and thus form a link between *C. smilacis* var. *asperae* [ibid., xv, p. 683] of Fragoso in Catalonia and the Balearic Islands (14-septate conidia up to 160 μ long) and the forms found by Thümen in Portugal and Istria (10-septate, 60 by 4 μ). A collection on 7th December, 1942, (a warm damp day) showed conidiophores with marked conidial budding.

A fungus in Var causing large, angular, ochraceous, zoned spots on *Rhus coriaria* is named *Cercospora rhoiscoriariae* n.sp. The subcylindrical, obtuse, straight or

slightly curved, continuous or, occasionally, uniseptate, faintly olivaceous conidia measure up to 32 by 3 μ.

ROGERS (D. P.). **The meaning of Article 57 of the International Rules.**—*Mycologia*, xl, 2, pp. 241–254, 1948.

The writer presents evidence from which he concludes that Article 57 of the International Rules should remain essentially unchanged and that a *Uredo* should not be considered part of the perfect state of a rust.

ROUTIEN (J. B.). **Hyphal proliferation through clamp-formation in Polyporus cinnabarinus Fr.**—*Mycologia*, xl, 2, pp. 194–198, 1 fig., 1948.

The formation of branches arising from clamp connexions in sporophore tissue cultures and paired basidiospore cultures of *Polyporus cinnabarinus*, which formed many such branches, is described in detail.

SPRAGUE (R.) & MEINERS (J. P.). **Additional parasitic fungi on Gramineae in the Inland Empire.**—*Plant Dis. Reptr*, xxxii, 6, pp. 245–247, 1948. [Mimeographed.]

This further contribution to the list of fungi found on Gramineae in the western region of the United States [cf. *R.A.M.*, xxvii, p. 357] includes new State records of hosts of *Fusarium nivale* [*Calonectria graminicola*] and other fungi.

TAKAHASHI (W. N.) & RAWLINS (T. E.). **An electron microscope study of Tobacco mosaic virus extracted from pulp and juice after various periods of infection.**—*Phytopathology*, xxxviii, 4, pp. 279–282, 1948.

As in a previous electron microscope study on the tobacco mosaic virus [*R.A.M.*, xxv, p. 476], the lengths of the particles in the present investigation usually fell into three fairly distinct groups, viz., (1) under 225 mμ, 225 to 463 mμ, and exceeding 463 mμ [cf. ibid., xxvii, p. 162]. When the virus is extracted from finely macerated pulp and juice at the pH of the latter (5·6), the proportion of short particles increases from the 4th to the 16th day, as also does the concentration per cell of short and medium-length particles. The short particles did not result from fracture of the medium-length ones during maceration.

WOLF (F. T.) & WOLF (F. A.). **A toxic metabolic product of Fusarium oxysporum var. nicotianae in relation to a wilting of Tobacco plants.**—*Phytopathology*, xxxviii, 4, pp. 292–298, 1948.

Cultured in a modified Richards's solution, *Fusarium oxysporum* var. *nicotianae* [*R.A.M.*, xxv, p. 237] produces a substance which causes wilting of tobacco leaves and of the stem tip, multiple small areas of necrosis in the laminar tissues, and collapse of the vascular elements in the proximal portions of the leaves. The toxic properties reside both in the culture filtrate and in the mycelium.

The chemistry of the toxic principle is not yet fully understood. The toxin is thermostable and non-volatile, and the available evidence indicates that it is insoluble in ether or acetone, partially soluble in methyl alcohol and ethyl alcohol, is not a nitrate, an ammonium salt, an aldehyde, a ketone, an amine, or a protein, and is not identical with lycomarasmin, a toxin from *F.* [*bulbigenum* var.] *lycopersici* inducing tomato wilt [ibid., xxvii, p.453]. There appear to be two or more toxic factors involved, one primarily responsible for wilting and another for necrosis.

Plant diseases. Big bud (rosette) of Tomatoes and other plants.—*Agric. Gaz. N.S.W.*, lix, 3, pp. 139–143, 11 figs., 1948.

Although tomato big bud [tomato big bud virus: *R.A.M.*, xxvii, p. 394] has been reported from all tomato growing areas in New South Wales, losses occur

only in the neighbourhood of Windsor and the Upper Hunter Valley and to the west of the Dividing Range during seasons which favour the spread of the disease by the jassid *Thamnotettix argentata* [ibid., xxii, p. 457] and any other vectors that may be concerned. A description is given of big bud symptoms on tomato plants and a list of some 36 hosts (including weeds, many ornamentals, tobacco, and vegetables), on which it appears in the form of virescence, is supplied. It is recommended that crops should be grown from seed and kept free from weeds to lessen the likelihood of invasion by infected jassids, and dusted with 1 per cent. D.D.T. during October and November when infection by the virus most commonly occurs.

RACOVITZA (A.). **Remarques sur l'Actinopelte dryina (Sacc.) v. Höhnel et le genre Actinopelte Sacc.** [Notes on *Actinopelte dryina* (Sacc.) v. Höhnel and the genus *Actinopelte* Sacc.]—*Bull. Sect. sci. Acad. roum.*, xxviii, 6, pp. 402–411, 7 figs., 1946. [Received April, 1948.]

In August, 1942, pale brown, darkly outlined leaf spots, 2 to 15 mm. in diameter caused by *Actinopelte dryina* [*R.A.M.*, xxiv, p. 341] were found for the first time in Rumania on leaves of oaks (*Quercus cerris* and *Q. petraea*) in a forest near Rovinari. Several pycnidia measuring 45 to 93 μ in diameter and 6 to 9 μ across the centre were found at all stages of development on the upper surface of the young leaves. The pycnidiospores measured 10·5 to 13 by 6 to 7·5 μ. The greater part of the paper is devoted to the history of the taxonomy of the genus *Actinopelte*.

[DAY (W. R.).] **Forest pathology.**—*Rep. imp. For. Inst., Oxford, 1946–47*, pp. 8–12, 1948.

In this report [cf. *R.A.M.*, xxv, p. 482] it is stated that during the winter of 1946 an examination was made of the roots of various conifer species growing near Oxford, many of which had been overturned by a gale. The wood was on ground with an impeded subsoil drainage. Dead secondary roots were common wherever waterlogged conditions had existed intermittently for long periods, and occurred, though less frequently, in the upper soil layers, which were sometimes severely affected by drought. Fungi known to be the cause of root decay and butt rot were isolated in only three trials out of thirty-six. It appears that the early stages of root disease are not necessarily produced by the fungi which later become dominant on the root system or cause butt rot in the main stem. Further evidence from a young Douglas fir [*Pseudotsuga taxifolia*] plantation in Shropshire on sandstone soil and infected with *Fomes annosus* clearly demonstrated that a partial dying of the roots had been caused by non-parasitic factors; growth recovery had followed, and this had quickly been succeeded by infection. These observations support the view that the physical make-up of the soil, including the water–air régime prevailing in it, usually supplies the fundamental conditions for the infections accompanying the dying of roots and causing butt rot.

Investigations were continued into the infection of the roots of large conifers by species of *Phytophthora* and, possibly, *Pythium*. Isolations plainly indicated that more than one species of fungus occurs and work on this complex is continuing.

The anatomy of cankers found at the base of Corsican pine [*Pinus nigra* var. *calabrica*] indicated that frost injury was the basic cause of their development, even in the absence of crown injury. Two species of fungi were isolated, apparently of only secondary importance.

Die-back of Japanese larch [*Larix leptolepis*] in Dorset on chalky soil attacked the top of the crown and seemed evidently due to frost injury. The occurrence of severe injury only when a dense pole state has been reached agrees with the development of frost die-back in European larch and Corsican pine, which also shows a marked tendency to be most severe after a closed canopy has been formed.

This seems related to restricted air circulation in the plantation, and needs meteorological investigation.

Material was also examined from Lombardy poplars [*Populus nigra* var. *italica*] severely affected by die-back. Frost injury followed by bacterial infection appeared to be the chief factors involved. Re-examination of slides prepared from early stages of bacterial canker indicated that susceptibility to frost injury should be taken into account when investigating the causes of differences in resistance to bacterial canker found in different poplar strains.

Laing (E. V.). **Preliminary note on a disease of Sitka Spruce in Cairnhill Plantation, Durris, Kincardineshire (Picea sitchensis Carr).**—*Forestry*, xxi, 2, pp. 217–220, 1947 (issued 1948).

Sitka spruce (*Picea sitchensis*) trees growing in a plantation at Durris, Kincardineshire, planted in 1909–10 and interspersed with Norway spruce (*P. abies*) have been in a diseased condition for some years. A few have died, some appear dying, others are badly shaped, and most show resin exudation from the bark. The condition was first observed after brashing and pruning in 1934, though some trees left untreated are affected. Severely diseased trees have fluted stems. Cross-sections of these showed that parts of the cambium were killed soon after brashing or pruning, though growth continued in the areas between the branches. The lesions were narrow and longitudinal and in some cases cracks were present. In the dead bark was abundant mycelium, and in the fissures numerous conidia of *Nectria cucurbitula* [*R.A.M.*, v, p. 146; vi, p. 683]. In 1944 the ascigerous state of this fungus appeared round the lesions. The bark showed abnormal lenticel development. No trace of the moth *Laspeyresia pactolana*, which on the Continent has been reported to cause wounds permitting entry of the fungus, was found on the affected trees.

Pehrson (S. O.). **Studies of the growth physiology of Phacidium infestans Karst.**—*Physiol. Plantarum*, i, pp. 38–56, 1 fig., 1 graph, 1948.

Studies on factors affecting the growth of *Phacidium infestans* [*R.A.M.*, xxi, p. 508] in culture demonstrated that the fungus showed a marked optimum in growth rate at 15° C. There was no growth at 27°, and cultures incubated at this temperature for 24 days did not develop on transfer to 15°. Growth occurred at −3°. Acclimatization of a culture at 0° promoted rapid growth just below zero. The fungus withstood a temperature of about −20° for a prolonged period. At 5° the pH optimum approximated to 4·5, at 10° to 5, at 15° to 5·5, and at 20° to about 6.

The fungus was found to be thiamine-autotrophic, but its capacity for synthesis was very low. There is probably some relationship between this reduction and the parasitism of the organism. The growth-stimulating effect of yeast extract can be replaced only by thiamine plus inositol when the fungus is grown on a synthetic medium. Growth was better in the presence of pyrimidine plus thiazole than with thiamine or pyrimidine alone.

Marsden (D. H.). **A Valsa associated with Cytospora canker of Spruces.**—*Phytopathology*, xxxviii, 4, pp. 307–308, 1948.

A species of *Valsa* recently found associated with cankers on Colorado blue spruce (*Picea pungens* var. *glauca*) and Norway spruce (*P. abies*) in Massachusetts was stated by Dr. E. Wehmeyer to represent the *Leucostoma* type, which he has referred to *V. kunzei*, the perfect state of *Cytospora kunzei* [*R.A.M.*, xvi, p. 648].

The perithecial stromata of the fungus on the cankered branches are rather widely scattered, rarely confluent, and often interspersed with pycnidial stromata. They are seated in the cortex, circular to fusoid, pustulate, greyish-black, and

measure 1·5 to 2·5 mm. in diameter. The truncate-conical ectostroma is surmounted by a greyish disk, 0·5 to 0·75 mm. in diameter, bearing numerous black ostioles. It contains 7 to 20 densely packed, globose, leathery, yellowish to black perithecia, 447 to 616 by 431 to 631 μ, exclusive of the necks, which measure 616 to 1,032 by 92 to 169 μ, and are lined with delicate hyphae. Paraphyses are absent. The numerous broadly clavate, sessile or subsessile, hyaline asci, 20 to 30 by 5 to 7 μ, are occupied by biseriate or bunched, allantoid, hyaline ascospores, 5·7 by 2·5 μ, which on germination on potato dextrose agar increase to an average size of 16·5 by 12 μ and become nearly oval, oblong, or sometimes dumb-bell shaped; they are usually biguttulate. Germ-tubes are formed at both ends of most spores, one or three being less frequently produced. The hyaline, unequally septate hyphae begin to branch irregularly 18 to 24 hours after germ-tube formation.

Single-ascus and single-ascospore cultures on potato dextrose and spruce decoction agar were compared with those from pycnidiospores of the *Cytospora* causing the spruce cankers. Both the asco- and pycnidiospores gave rise to a dull white or cream-coloured, appressed mycelium, roughly circular or with fans, and having an irregularly crenate margin. Faint concentric zones of lighter and darker shades were formed. By the 25th or 30th day after inoculation rudimentary pycnidia were formed, each consisting of a firm, black centre, tufted with grey hyphae, and containing allantoid spores.

The growth and aspect of the *Valsa* and of the *Cytospora* were almost identical on steam-sterilized twigs of the two hosts. The mycelia grew from the cut ends and from the needle cushions in mats of white hyphae, and 25 to 30 days after inoculation superficial, globose, greyish pycnidia developed, containing hyaline, allantoid pycnidiospores, 6 to 7 by 2 μ.

On 24th April, 1947, ten lateral branches and one trunk of five-year-old Norway spruces were inoculated in the greenhouse through razor-cuts with mycelium from single-ascospore cultures, six control inoculations with sterile agar being made in the same manner. On the following 29th July, five of the branches inoculated with the fungus were dead, two others cankered but still living, and the remaining three healthy. The inoculated trunk bore a resinous canker extending half-way round the tree. The fungus was re-isolated from each of the cankered branches. All the controls remained healthy.

Marshall (R. P.) & Waterman (Alma M.). **Common diseases of important shade trees.**—*Fmrs' Bull. U.S. Dep. Agric.* 1987, 53 pp., 43 figs., 1948.

After an introductory section dealing briefly in general terms with the various causes of disease in shade trees [*R.A.M.*, xviii, p. 354], types of diseases, and control methods, the authors give brief practical notes on the symptoms, causes, and control of those affecting 41 trees in the United States, arranged alphabetically under the common names. The diseases so dealt with include, among many others, ash rust (*Puccinia peridermiospora*) [ibid., xxv, p. 204], anthracnose (*Gloeosporium aridum*), characterized by large, pale brown spots, and white mottled rot (*Fomes fraxinophilus*) [ibid., xxii, p. 184]; birch white trunk rot (*F. igniarius*) [cf. ibid., xvi, p. 715]; the *Verticillium* wilts of elm and maple [ibid., xviii, p. 281]; hawthorn rust (*Gymnosporangium globosum*) [ibid., xxiii, p. 156], fire-blight (*Erwinia amylovora*), and leaf spot (*Fabraea maculata*) [cf. ibid., xx, p. 213]; black mould of basswood [*Tilia* spp.] (*Fumago vagans*) [ibid., xviii, p. 56], which also attacks other trees, sometimes causing defoliation; maple anthracnose (*Gloeosporium apocryptum*) [ibid., xxv, p. 51], white spongy rot (*Hydnum septentrionale* and *Fomes connatus*), and bleeding canker (*Phytophthora cactorum*) [ibid., xxiv, p. 257]; crown canker of dogwood [*Cornus florida*] due to the same organism; oak leaf blister (*Taphrina caerulescens*) [ibid., xxi, p. 271], basal canker (*Bulgaria inquinans*) [ibid., xxi, p. 272], which may kill the tree by girdling, and *Strumella* canker (*S. coryneoidea*)

[ibid., xxv, p. 85]; spruce canker (*C. kunzei*) [see preceding abstract]; willow white wood rot (*Trametes suaveolens*) [ibid., xxiii, p. 464]; and the following:

Grey mould twig blight (*Botrytis cinerea*) [? *Sclerotinia fuckeliana*: ibid., xii, p. 316; xvi, p. 290] frequently kills the ends of shoots of Douglas fir [*Pseudotsuga taxifolia*] in wet springs. True firs [*Abies* sp.], larches, and other conifers are sometimes affected. The tip of the young growth becomes a cluster of dead, curled leaves, and under wet conditions is covered by cobwebs of grey mycelium bearing spores. The disease does not progress after the leaves mature. Treatment consists in careful thinning to improve aeration.

Sphaeropsis ulmicola [cf. ibid., xviii, pp. 281, 354] causes die-back and canker of the twigs and branches of American elm. Infection spreads downwards from the small twigs into the larger branches, a brown discoloration of the wood just below the bark of the infected areas indicating the presence of the fungus. Rapidly growing secondary shoots sometimes develop below the cankers. Trees weakened by drought or poor growing conditions appear to be susceptible. Treatment includes improving tree vigour by fertilizing; infected wood should be excised well below the cankers.

Larch canker (*Dasyscypha willkommii*) [ibid., xxiii, p. 50], introduced on diseased nursery stock from Great Britain, attacked ornamental European larches [*Larix decidua*] in eastern Massachusetts. The American larch [*L. laricina*] is susceptible, but has not been found to be infected in the United States. Japanese larch [*L. leptolepsis*] is relatively resistant, and golden larch [*Pseudolarix koempferi*] is susceptible. Removal of all affected trees is the only reliable way to prevent spread. It has been controlled by this method in the few localities in New England where it has appeared.

Persimmon wilt (*Cephalosporium diospyri*) [ibid., xxiii, p. 367] is important in Tennessee, Georgia, Florida, and North and South Carolina; it also occurs in a few localities in Mississippi and Alabama. The Japanese persimmon [*Diospyros kaki*] is more resistant than the American, but may be killed by the fungus if grafted on American stock. No effective control measures are known.

Smolák (J.). **Virosa smrku.** [Spruce virosis.]—Reprint from *Lesn. Práce*, xxvii, 4–5, 4 pp., 2 pl., 1948. [English summary.]

During 1945–7 the author observed unusual symptoms of mosaic and chlorosis on young spruce trees in the forests of Železné and Jizerské hory in Czechoslovakia. The foliage of affected trees first showed only slight mottling, later turning yellow. Some branches of diseased trees remained green and sometimes the leaves on one side of the twig were chlorotic, pale yellowish-green or yellowish-white, while the other side appeared normal. The symptoms were not constant, being greatly influenced by the temperature. The disease was increasing especially in one locality in Železné hory, where the whole trees became chlorotic. An increasing number of aphids (*Chermes* sp.) appeared on the affected trees. It is concluded that the disease is caused by a virus.

Spackman (W.) & Tippo (O.). **Wood preservatives. Effect on seam compounds and value as paint primers.**—*Industr. Engng Chem.*, xl, 7, pp. 1301–1308, 9 figs., 2 diags., 1948.

A study at the Philadelphia Naval Shipyard of 832 Douglas fir [*Pseudotsuga taxifolia*] and southern yellow pine [*Pinus palustris*] panels simulating ship planking showed that wood preservatives of the copper naphthenate, chlorinated phenol, and phenyl mercury oleate types [*R.A.M.*, xxvii, p. 268] exert no deleterious action on the caulking compounds used to seal the seams of wooden vessels. The preservatives themselves are of little value as paint primers.

Szuleta (J.). **Cyto-chemiczne zmiany drewna sosnowego pod wływem grzybów Poria vaporaria Fr., Poria vaillantii (D.C.) Fr. i. Merulius lacrymans Fr.** [Cyto-chemical changes of Pine wood under the influence of the fungi *Poria vaporaria* Fr., *Poria vaillantii* (D.C.) Fr. and *Merulius lacrymans* Fr.]—*Acta Soc. Bot. Poloniae*, xviii, 2, pp. 217–236, 3 pl., 12 figs., 1947. [French summary.]

The results of experiments, in which pieces of sterilized pine wood (*Pinus sylvestris*) were kept for three to four months in cultures of *Poria vaporaria*, *P. vaillantii*, and *Merulius lacrymans* [*R.A.M.*, xxvi, p. 572] grown on beer-wort agar, showed that the hyphae penetrate the middle lamella as well as the tracheids themselves. The medullary rays and resin canals were also attacked. Enzymatic decomposition resulted first in the disappearance of the lignin. *M. lacrymans* was the most destructive of the pathogens. Its hyphae, measuring 1·5 to 2·5 μ in diameter, penetrated easily the lignified cell walls, which were also decomposed at various points by enzymes secreted by the fungus, causing numerous apertures, presenting an appearance of geometric patterns. The hyphae formed a few 'medallion' clamps [ibid., xiii, p. 137].

The *Poria* spp. formed numerous 'medallion' clamps. The hyphae of both species penetrated and destroyed the wood cells in the same manner, the only difference between them being that those of *P. vaporaria* were thicker, measuring 2·2 to 4 μ in diameter (those of *P. vaillantii* 1·8 to 3·2 μ), and produced more chlamydospores.

Goidànich (G.) & Camici (Leontina). **Un cancro del Leccio prodotto da Epidochium ilicinum sp. n.** [An Evergreen Oak canker caused by *Epidochium ilicinum* n.sp.]—*Ann. Sper. agr., N.S.*, i, 3, pp. 521–531, 8 figs., 1947. [English summary.]

During 1941, evergreen oaks [? *Quercus ilex*] in the Maccarese area of Rome developed a form of canker. Small lesions appeared in the cortex of branches up to 8 cm. in diameter and gradually spread into the woody cylinder. Circular, depressed, dead areas surrounded by a raised circle of apparently healthy tissue were usually separated from it by deep cracks. Transverse sections through the affected areas showed a conical area of chestnut-red discoloration extending deeply into the woody cylinder with the apex pointing to the central medulla.

Microscopic examination showed that in the affected parts the phloem, cambium, and discoloured part of the xylem were completely necrotic. Nearly all the larger tracheae and some of the smaller ones, some of the vessels, and the cells of the medullary rays were occluded with gum. Tyloses formed in the tracheae.

From the affected parts a fungus was isolated which grew rapidly in culture (10 mm. every 24 hours on carrot agar at 25° C.), forming white colonies with yellow or cream tones. A striking character was that the mycelium displayed different degrees of development in alternate zones. Round the inoculum there was a flocculent mass a few mm. high on the surface of the medium. The colony then spread in the form of an immersed or creeping mycelium, progesssing fan-wise, at the extremity of which the flocculent mycelium reappeared. This phenomenon became progressively more frequent. After six or seven days, on the outer edge of the central zone, there appeared dark, later almost black, areas a few mm. wide and of various lengths; they almost invariably became confluent and formed a ring. Other rings developed concentrically, the outermost at the periphery. With age, the mycelium formed thick bodies up to 7 mm. in diameter.

The mycelium is composed of two kinds of hyphae, sparsely septate ones about 2 μ wide, with a nearly homogeneous plasma, and others 5 to 6 μ in diameter with a granular vacuolate plasma, a double membrane, and septa averaging 20 to 30 μ apart. The diameter of both types is constant for very short distances, then, very often, wedge-shaped protuberances arise, which give the hyphae a somewhat spiny

appearance. A noteworthy feature is the appearance of short lateral branches, which bend back towards their point of origin resembling the clamp connexions of Basidiomycetes.

The conidiophores grow almost at right angles to the mother hyphae, bearing at the apex phialides in irregular verticils. Isolated conidiophores were seldom observed, and as a rule the fructifications are of the sporodochial type. The conidia are ellipsoidal or oval-piriform, hyaline at first, then light olivaceous-brown, and enveloped in a mucous substance which later appears as opalescent drops over the zones of darkened mycelium. They measured 11 by 7 μ. The fungus is considered to be a new species of *Epidochium* and is named *E. ilicinum* n.sp.

Experimental wound inoculations of evergreen-oak branches on trees of various ages, after ten months gave symptoms resembling those found in nature. The fungus was re-isolated from the affected parts. Further studies are in progress.

Foister (C. E.). **Report of the Annual Conference of the Cryptogamic Section, 1946.**—*Trans. bot. Soc. Edinb.*, xxxiv, 4, pp. 392–396, 1948.

During a foray held on 5th October 1946 at Glentress, Peebles, the Cryptogamic Section of the Botanical Society of Edinburgh recorded *Rhabdocline pseudotsugae* causing considerable damage to Douglas fir (*Pseudotsuga taxifolia*). Among other interesting records mention may be made of *Keithia* [*Didymascella*] *tsugae* on *Tsuga canadensis*.

Burchfield (H. P.) & McNew (G. L.). **Quantitative determination of tetrachloro-p-benzoquinone on treated seed.**—*Phytopathology*, xxxviii, 4, pp. 299–306, 1 graph, 1948.

Exceptionally reliable results have been given by a simple colorimetric method of analysing samples of pea, maize, Lima bean [*Phaseolus lunatus*], spinach, and beet seed treated with spergon (tetrachloro-*para*-benzoquinone) [cf. *R.A.M.*, xxiii, p. 510 *et passim*] at various dosage levels ranging from a quarter to four times the prescribed concentration. Briefly, the procedure consists of washing the chemical from the seed with acetone, adding diethylamine, and measuring the amount of light absorbed by the resultant yellow reaction product. The optical density is directly proportional to the amount of spergon dissolved from the seed.

Maclachlan (J. D.) & Strong (W. F.). **Spraying and dusting Turnips to prevent water core, a disorder caused by boron deficiency.**—*Sci. Agric.*, xxviii, 2, pp. 61–65, 1 fig., 1948.

Large-scale experiments carried out in western Ontario in 1945 and 1946 demonstrated that foliage applications of borax as a spray or dust gave very satisfactory results in the prevention of water core (or brown heart) of turnips caused by boron deficiency [*R.A.M.*, xxiii, p. 372; xxvi, p. 434]. The spray ingredients are 12 lb. borax of sufficient fineness to pass through nozzles in suspension, mixed dry with 3 lb. bentonite clay and added to 1 pint orthex in 40 gals. water. The prepared mixture is sold by the Niagara Brand Spray Company, Burlington, Ontario. The dust ingredients are 300-mesh borax and No. 209 celite mixed in equal proportions by weight. This mixture is sold by the Bartlett Spray Works, Beamsville, Ontario, The Niagara Brand Spray Company, and Canadian Industries, Limited, Toronto. An application of 40 to 50 gals. spray or 40 to 50 lb. dust per acre should be made when the diameter of the turnip root is between 1 and 1½ in. In localities where spray or dust equipment is unavailable and where soil fixation of boron is rapid, granulated borax should be applied as a side-dressing or broadcast with a hand cyclone grass-seeder at the rate of 20 to 30 lb. per acre after thinning.

LEGGATT (C. W.). **Germination of boron-deficient Peas.**—*Sci. Agric.*, xxviii, 3, pp. 131–139, 1 pl., 1948.

After stating that boron-deficient pea seeds appear normal, but when germinated develop rather pale, stunted shoots, which lack the typical recurved, plumular bud and fail to develop, the author describes an experiment in which nine samples of Resistant Surprise pea seed grown in a boron-deficient area in British Columbia were tested in various media with and without boron. The results showed that the addition of boron, either in the form of a 0·01 per cent. borax solution to damp the germination medium or as a dust applied to the seed (diluted to 1 in 10 with talc), completely overcame the sprout abnormality. Also, testing with and without added boron provided a positive means of identifying this type of abnormality. It was further found that certain sawdusts mixed with sand also corrected the condition, so that when such media are used the presence of this deficiency in peas may be concealed.

ELLIS (D. E.) & COX (R. S.). **Dusting Cucumbers to control downy mildew.**—*Bull. N. C. agric. Exp. Sta.* 362, 16 pp., 4 figs. (3 col.), 2 graphs, 1948.

In North Carolina, cucumber production is estimated to have been reduced each year since 1945 by at least 30 per cent. as a result of infection by downy mildew (*Peronoplasmopara* [*Pseudoperonospora*] *cubensis*) [*R.A.M.*, xxvi, p. 478; xxvii, p. 346]. The fungus cannot withstand the comparatively cool winter conditions in North Carolina unless on living cucumber or other susceptible hosts, but it persists during the winter in Florida and other sub-tropical areas, where cucurbits are grown all the year round, and spreads thence northwards along the Atlantic seaboard. If the weather conditions are favourable the fungus may reach North Carolina by the last week in May; under dry conditions it may not arrive before the first week of July.

The following control recommendations are made [cf. ibid., xxvii, pp. 8, 248]. Dusting with tribasic copper sulphate containing 5 per cent. metallic copper in a suitable diluent should be started in wet seasons on or before 5th June in the southern parts of the State, by 12th June in the middle, and by 20th June in the north. A delay of seven to ten days is permissible if the season is dry. Application should be made at least once every ten days and after every fall of rain of $\frac{1}{4}$ in. or more. The dust should be applied at the rate of 15 to 20 lb. per acre on each occasion when the plants are small and at the rate of 35 to 50 lb. per acre later on. Both leaf surfaces should be covered.

SMITH (F. L.). **California Blackeye 5, State's third most important dry Bean being improved for wilt resistance.**—*Calif. Agric.*, ii, 7, p. 14, 1948.

Blackeye 5, which during the past 20 years has become the most widely used cowpea variety in the southern United States, has now become susceptible to wilt [*Fusarium bulbigenum* var. *tracheiphilum*: *R.A.M.*, xiv, p. 208; xxiv, p. 355]. Various Blackeye strains are being tested in California for resistance to this disease and at present Blackeye 7, a promising selection after three years' testing, is being increased for commercial production in 1949. Further crossing between this variety and the wilt-resistant Iron should give increased resistance.

WATSON (R. D.). **Carrot bacterial blight control in Idaho.**—*Plant Dis. Reptr*, xxxii, 6, pp. 238–239, 1948. [Mimeographed.]

The first major field trials to test the efficacy of control measures against carrot bacterial blight (*Xanthomonas carotae*) [*R.A.M.*, xxv, p. 248] were started in Idaho in 1945. The methods devised by E. C. Blodgett and G. Ken Knight [ibid., xxv, p. 206] were used. Surveys in 1946 of 28 carrot seed fields, all grown from

commercially treated seed, showed that 13 were free from blight, 13 had traces, and two, which had had a seed crop the previous year, contained 15 and 60 per cent. infected heads, respectively. These results indicate the efficacy of the control measures, which, when carefully executed, should completely eliminate losses in yield due to bacterial blight.

McKeen (C. D.). **An occurrence of soft rot in Peppers and its relation to the Corn borer.**—*Sci. Agric.*, xxviii, 3, pp. 142–143, 1 fig., 1948.

During late August and early September, 1947, green, partially ripe, and ripe fruits of sweet and hot chilli pepper varieties in southern Ontario developed a soft rot progressing rapidly, usually down one side, and leaving the tough epidermis dried to a parchment-like membrane hanging from the end of the peduncle. Generally, the rot spread down the peduncle and occasionally the main stem was attacked. Branches that arose from this region frequently split at this point later. *Erwinia carotovora* [*R.A.M.*, xxiii, p. 291] was isolated from fruits showing incipient and later stages of the condition, and from fruit stalks with decayed tissues. Inoculations of wounded (though not of unwounded) green and ripe chillis reproduced the disease. It appears that injury by the borer *Pyrausta nubilalis* provided means of ingress for the rot organism in every case examined.

Steckel (J. E.). **Manganese-deficient Soybeans in Indiana.**—*Soybean Dig.*, viii, 8, pp. 14–15, 3 figs., 1 map, 1948.

Farmers in northern Indiana have noted for several years a yellow, sickly appearance of soy-beans in scattered spots in their fields. Rapid recovery followed spraying with manganese sulphate (10 lb. per acre) [cf. *R.A.M.*, ix, p. 557], and in 1946 a study was begun to measure the response of soy-beans to manganese. The evidence obtained showed that the response to soil applications of manganese [amount unspecified] increased production up to 15 bush. over the untreated which yielded 16 bush. per acre. Spray applications (10 lb. manganese sulphate per acre dissolved in 100 gals. water) were equally effective. In other experiments, in widely separated areas of northern Indiana, spray applications of manganese sulphate at a cost of $3 per acre increased yields by 4 to 16 bush. per acre.

Where soy-beans are planted in fields which have already shown manganese deficiency, it is recommended that 100 lb. commercial manganese sulphate mixed with the starter fertilizer, or 25 lb. mixed with the usual amount of fertilizer applied to each acre, should be added to the side of the seed in the row at planting. When manganese deficiency symptoms appear after emergence, the plants should be sprayed with 10 lb. manganese sulphate in 75 gals. water per acre.

Gaudineau (Mlle M.). **Les invasions d'Oidium sur Vigne et le choix du mode de lutte.** [Vines attacked by *Oidium* and the choice of a method of control.]—*C. R. 1er Congr. int. Phytopharm.*, pp. 219–225, 1 fig., 1946. [Received June, 1948.]

From 1941 to 1945 studies were made at La Grande-Ferrade to determine the efficacy of various products containing little or no sulphur in controlling *Oidium* [*Uncinula necator*: *R.A.M.*, xxvii, p. 409] on the very susceptible Cabernet-Sauvignon and the more resistant Malbec vines. Although in 1944 a winter spray containing an anthracite oil and another pyroligneous acid resulted in only 3·9 and 5·6 per cent. diseased branches against 13·9 and 10·7 per cent. for the controls, respectively, it is evident that the spring and summer sprays cannot be neglected. The results of experiments with summer sprays in 1944 have already been noted [ibid., xxv, p. 490]. The author arrives at the following conclusions from her investigations. Treatments should be applied as early as possible to prevent the disease spreading from the primary foci of infection (i.e., the shoots) to the other parts of the vine. Dusting with flowers of sulphur should be applied first to these

foci and then to the bunches once they have ripened. Dusting with natural sulphur enriched to 20 per cent. sulphur gives good results when attacks are light, but in the case of heavy infection sublimed sulphur or ores rich in sulphur should be used. When wettable or colloidal sulphur is added to copper mixtures, the sulphur content should be at least 500 gm. per hl., and preferably 1,000 to 1,500 gm.

KASSANIS (B.) & KLECZKOWSKI (A.). **The isolation and some properties of a virus-inhibiting protein from Phytolacca esculenta.**—*J. gen. Microbiol.*, ii, 2, pp. 143–153, 1948.

A substance inhibiting plant viruses has been isolated from the sap of *Phytolacca esculenta*. It is probably a glycoprotein and like other protein inhibitors [*R.A.M.*, xxi, p. 392] it is isoelectric at about pH 7. It combines with tobacco mosaic virus and precipitates it in paracrystalline threads when the two are mixed in certain proportions in salt-free solutions at pH values between their isoelectric points. It also precipitates tomato bushy stunt virus. However, the combination of the virus with the inhibitor is not considered to be essential to inhibition and experimental evidence suggests an effect on the host rather than on the virus. The addition of the substance to tomato bushy stunt virus, potato virus X, the Rothamsted culture of tobacco necrosis virus, and cucumber mosaic virus caused immediate reduction in infectivity, but the activity of a bacteriophage was not affected. Dilution with water restored the infectivity of non-infective mixtures.

PEROTTI (R.). **Note fitopatologiche per gli anni 1941–1945.** [Phytopathological notes for the years 1941–1945.]—*Ann. Fac. agr. Pisa*, N.S., viii, pp. 69–83, 2 graphs, 1947.

This report [cf. *R.A.M.*, xxvi, p. 229] on plant diseases in the provinces of Pisa, Livorno, and Grosseto, Italy, from 1941 to 1945, includes *inter alia* the following item of interest. The only serious vine disease was root rot caused by *Rosellinia necatrix* [ibid., xxv, p. 436; xxvi, p. 533] in association with other organisms [unspecified].

URQUHART (D. H.). **Report on the Department of Agriculture, Gold Coast, for the year 1946–7.**—16 pp., 1948.

In this report [cf. *R.A.M.*, xxvi, p. 286] it is stated that the cutting-out of swollen shoot infected cacao trees [ibid., xxvii, pp. 178, 515] and re-inspection of treated areas were continued during the year, the success of the scheme depending on its thorough and comprehensive application over the whole cacao-growing area to control new outbreaks. The lack of co-operation by farmers in this respect necessitated the enactment, on 28th December, 1946, of the Swollen Shoot Disease of Cacao Order, 1946, and The Swollen Shoot Disease of Cacao (Control) Regulation, 1946, to enable the Government to undertake the direct control of the disease and the establishment of new cacao areas. In the Eastern Province the disease is spreading rapidly amongst the remaining healthy trees in the main area of infection and into the surrounding area of scattered outbreaks. So far, efforts have been directed towards controlling all limited outbreaks in the Eastern Province, Ashanti, and Trans-Volta and at the same time removing all infections from those parts of the main area of infection where there is a high proportion of relatively disease-free seedlings. At the end of March, 1947, the total cacao area surveyed in the Eastern Province, Ashanti, Trans-Volta, and Western Province amounted to 221,956, 52,456, 1,885, and 5,471 acres, respectively. In the initial treatment in the first three areas 1,022,013, 182,058, and 15,588 trees were cut out, respectively, and after re-inspection a further 35,362, 19,308, and 25 trees, respectively.

A visiting officer, Mr. R. G. Fennah, conducted further investigations into the cause of widespread decline of lime plantations. The likelihood of *Ganoderma*

lucidum being actively parasitic on lime roots is very slight since spot map records indicated that the fungus did not spread evenly outwards from a centre of infection. Laboratory cultures obtained from diseased lime seedlings and trees yielded only saprophytic or weakly parasitic fungi, such as *Botryodiplodia theobromae* and *Diplodia*, *Fusarium*, and *Penicillium* spp., which failed to produce typical decline symptoms when inoculated into lime seedlings in the field. Of 48 seedlings planted in pots in soil from two infected farms all died within seven months compared with 37 per cent. mortality (nine out of 24 plants) in the same soils previously sterilized. Mr. Fennah concluded that the characteristic features of the decline closely resembled those noted in the West Indies several years ago [ibid., xxii, p. 355; xxv, p. 111]. Most of the trees examined showed symptoms of trace element deficiency and it is considered that these deficiencies, together with the deterioration of the mineral status in Gold Coast soils and the seasonal lack of water, are largely responsible for the present extensive dying of lime trees and for the major citrus problems of the area. Investigations into the cause of decline are being continued.

Plant pathology.—*Rep. N.Y. St. agric. Exp. Sta., 1947*, pp. 31–40, 50–52, 1948.

In this report [cf. *R.A.M.*, xxvii, p. 173] W. T. Schroeder and O. A. Reinking present the results of their studies on the effects of seven different vegetable crop rotations on the quality, yield, and incidence of root rot [*Aphanomyces euteiches*: ibid., xxvi, p. 1] of peas. The data for 1946, when root rot was not as severe as in 1945, indicated that under favourable environmental conditions, root rot infested soil can produce a good crop even though the previous year's pea crop was a failure. In both years root rot was most severe in the plots planted with peas continuously since 1940, and which had received no fertilizer, whereas in 1946 yields of the continuous pea plots which received fertilizer in 1945 were almost as high as rotation plots.

According to R. E. Foster, although a slight reduction in hop downy mildew [*Pseudoperonospora humuli*: ibid., xxvii, p. 248] was obtained in 1946 when the twine was treated with five different fungicides, the practice has been discontinued owing to its impracticability, and the spraying of poles with Bordeaux mixture is recommended. In 1946 three hop plants in a non-sprayed yard remained almost free from downy mildew, among severely attacked surrounding plants.

Tests conducted by A. J. Braun in 1946 showed that applications to grape vines immediately before and after bloom and 10 to 14 days later, using fermate (2–100) or Bordeaux mixture (8–8–100 or 4–4–100), gave excellent control of black rot [*Guignardia bidwellii*: ibid., xxvi, p. 182], fermate being the most effective when the disease was unusually severe. An additional pre-bloom application was found to be necessary when a severe attack was expected. The same three applications of Bordeaux mixture (4–4–100) effectively controlled downy mildew [*Plasmopara viticola*: ibid., xxv, pp. 201, 330], and Bordeaux mixture (2–4–100) applied one week and three weeks after bloom gave excellent control of powdery mildew [*Uncinula necator*: loc. cit.]. Vines receiving five applications of Bordeaux mixture (8–8–100) showed pronounced yellowing and drying of the leaves.

A single application of lime-sulphur (8–100), elgetol (1–100), dow 289, or dow 296 (the last two at a concentration equivalent to 1 per cent. elgetol) made at the expansion of the second and third leaves of the fruiting laterals gave excellent control of anthracnose [*Elsinoë veneta*: ibid., xxiv, p. 457] on Taylor raspberries. Lime-sulphur and elgetol both controlled the disease on the Marcy and Indian Summer varieties equally well. Dow 289 and 296 tended to injure the new foliage but did not impair subsequent growth from the buds.

D. H. Palmiter reports that in experiments conducted during 1946, a year of heavy infection of apple scab [*Venturia inaequalis*: ibid., xxvii, p. 480], fermate, hel 78e, and phygon appeared promising as effective and inexpensive materials for

use with sulphur. Fermate and karbam reduced late fruit infection. The new sulphur fungicide magnetic '70' paste was superior to the stiffer flotation pastes and other sulphurs while micronized sulphur (5–100) was more effective than flotation pastes of low sulphur content at 10–100.

J. M. Hamilton found that micronized sulphur and puratized agricultural spray [phenyl mercury triethanol ammonium lactate] were effective in controlling scab on McIntosh apples, the foliage sprayed with the latter being free from lesions. Tests made on potted, greenhouse-grown trees indicated that puratized is better as an eradicant at the time of infection than as a protectant. Fermate was one of the best materials tested; Z-78, hel 78e, phygon, copper 8 quinolate, and zerlate were effective in control but the last three caused injury. It is suggested that effective but injurious compounds might be useful as early season sprays.

D. H. Palmiter records that of various materials applied at the pink, bloom, petal-fall, and ten-day periods to a block of 40 Rome Beauty apple trees at New Paltz in the Hudson Valley, fermate gave the best control of cedar-apple rust [*Gymnosporangium juniperi-virginianae*: ibid., xxvii, p. 284], used either alone at 1–100 (when nine rust and eight scab leaf lesions per terminal were counted) or combined at 3–½–100 with micronized sulphur (13 and one lesions, respectively, compared with 138 and 46 on the unsprayed). An additional application at bloom is necessary if rain occurs during this period and especially when low concentrations are used.

In tests conducted by J. M. Hamilton, elgetol, dow DN dry-mix, and dow DN 289 completely controlled peach leaf curl [*Taphrina deformans*: ibid., xxv, p. 206] in spring applications at 1 quart, 1 lb., and 0·8 quart in 100 gals., respectively. Spraying with fungicides at higher concentrations to give a greater residue on the foliage is recommended for control of brown rot [*Sclerotinia fructicola*] of peaches. Zerlate [ibid., xxvii, p. 139] appeared to control this disease more effectively than sulphur.

Fermate proved far superior to the several other materials tested on Montmorency and Morello cherry trees in controlling leaf spot [*Coccomyces hiemalis*: ibid., xxv, p. 402] and brown rot [*Sclerotinia fructicola*: ibid., xxv, p. 400], Bordeaux mixture (1–3–100) plus micronized sulphur (3–100) being second in performance on Montmorency. All zinc-containing compounds severely injured Morello cherries.

W. F. Crosier reports (p. 50) that *Diplodia zeae* [ibid., xxvii, p. 120] and *Gibberella saubinetii* [*G. zeae*] were again the most common pathogens on maize seed stocks grown in New York State and in the Corn Belt in 1946, while *Fusarium moniliforme* [*G. fujikuroi*] was found in 3 per cent. of the lots examined.

Of the garden bean [*Phaseolus vulgaris*] seed lots examined *Rhizoctonia* [*Corticium*] *solani* [ibid., xxvii, p. 65] was present in only 0·5 per cent. About 20 per cent. of the 1946 seed contained up to 4 per cent. seeds infected with *Colletotrichum lindemuthianum* [ibid., xxvi, pp. 435, 476]. Ten per cent. of the red kidney bean [*P. vulgaris*] seed stocks originating in California were infected with *Corticium solani*. Fuscous blight (*Xanthomonas phaseoli* var. *fuscans*) [ibid., xxvi, p. 180] was again prevalent on seed on Robust, Norida, and Michelite pea beans [*P. vulgaris*] and on Marrow [loc. cit.] and yellow-eye beans.

The majority of the Vicland oat samples submitted for germination tests were infected with *Helminthosporium victoriae* [ibid., xxvii, p. 360]. In greenhouse tests Cornellian, Ithacan, and Lenroc seedlings remained free from the disease while Vicland seedlings showed 50 per cent. injury. *H.* [*Pyrenophora*] *avenae* [ibid., xxvii, p. 180] was present in a few lots of Victory oats.

In replicated experiments with 110 lots of Vicland oats infected with *H. victoriae*, new improved ceresan [ibid., xxvi, p. 380] and ceresan M (Du Pont 1452 F) increased the stand by 6 to 15 per cent., the average yield for each treatment being

66·8 and 64·8 bushels per acre, respectively, against 56 per cent. for untreated seed. Applications of at least ½ oz. dust per bush. seed were necessary for adequate control. *H. sativum* [ibid., xxvii, p. 231] was present in 1945 and 1946 barley seed.

Botrytis cinerea, *Phoma* sp., and *C. solani* were found in several lots of aster seed. Suspensions of arasan SF at 3 per cent. controlled mould fungi on 1,000 lots of field and vegetable seeds as effectively as 0·2 per cent. concentration of new improved ceresan.

Fifty-sixth Annual Report.—*Bull. Wash. St. agric. Exp. Sta.* 482, 121 pp. 5 figs., 1946. [Received March, 1948.]

In this report [cf. *R.A.M.*, xxv, p. 384] for the year ending 30th June, 1946, C. S. Holton states that two Rio × Rex winter wheat hybrid selections, C.I. 12246 and No. 382041, proved highly resistant to 25 races of bunt [*Tilletia caries* and *T. foetida*: ibid., xxvii, p. 228] and one (Rio × Alicel) was resistant to all except two. Results of tests confirmed previous findings that the Hussar–Martin–White Odessa gene group controls resistance to dwarf bunt [*T. caries*: ibid., xxvii, p. 12].

J. P. Meiners found that in all tested collections of head smut (*Ustilago bullata*) [ibid., xxvii, p. 187] comprising 20 species of grasses, only two sexes (+ and −) were represented and all collections were compatible. Some combinations paired more readily than others.

In a study of the soil fungus flora of 46 plots involving 22 types of rotation, G. Nyland found that from a plot planted continuously with spring wheat since 1919, the average number of fungus colonies per plate was 8·1, while from a corresponding plot manured with ten tons of barnyard per acre every third year, the average was 16·2. Pea plots had a high fungus population during the growing season, but this decreased rapidly after the harvest. *Penicillium* was the most common genus encountered, but *Fusarium*, *Trichoderma*, *Aspergillus*, and *Rhizopus* were also frequently isolated.

Using stationary spray systems with ¾, 1, and 1¼ in. lines and in various combinations of pipe size, length, and elevation, K. Groves, F. Johnson, and K. C. Walker found that the concentration of the spray materials in the system did not vary more than in the spray tank. A photo-electric instrument devised by K. Groves and F. Johnson enabled continuous measurement of the concentrations to be made. Chemical analyses showed that the first spray material from unused lines had lost its effectiveness through precipitation, and therefore some of the material should be allowed to run away immediately after opening a stagnant line.

R. M. Bullock, K. C. Walker, and N. Benson state that a concentration of 75 lb. zinc sulphate per 100 gals., used alone and in mixtures during the dormant period, caused no injury to Delicious apple trees. Summer sprays with zinc-containing compounds (2 and 4–100) in combination with acid lead arsenate, petroleum oil, and sodium fluo-aluminate (cryolite) gave excellent correction without injury of apple rosette [zinc deficiency: ibid., iii, p. 341; xxii, p. 210] in new growth following the treatment. Experiments are in progress with copper and manganese.

F. L. Overley reports that 4 lb. zinc sulphate applied to apple and pear trees immediately after harvest reduced the rosette condition if the treatment was followed by several frostless days. Affected pears responded more rapidly than apples. Small amounts of zinc in late cover sprays were beneficial to Winesap [apples], but they reduced the efficiency of lead sprays.

Some of the new strawberry hybrids, bred by C. D. Schwartze, showed marked resistance to yellows [yellow edge virus: ibid., xxvii, p. 430]. L. Campbell states that although the incidence of red stele of strawberries [red core: *Phytophthora fragariae*: ibid., xxvii, p. 373] is limited to areas of heavy soil with insufficient drainage, some fields in western Washington showed up to 50 per cent. infection. Diseased plants recover completely when set into light, well-drained soil.

F. Johnson reports that cane blight of evergreen blackberries [*Leptosphaeria coniothyrium*: ibid., xiii, p. 174] was successfully controlled and the yields in 1946 increased by over four tons per acre after spraying with fermate (1½–100) in July and August 1945.

E. P. Breakey and [?] Myhre showed that the number and size of Croft lily bulbs were greatly increased when the scales were thoroughly dusted soon after harvest with fermate, arasan, or spergon (in order of efficacy), stored in moist peat moss in a cellar, and incubated early in January at 65° F.

C. J. Gould and V. L. Miller found that basal rot of narcissus (*Fusarium oxysporum* f. *narcissi*) [*F. bulbigenum*: ibid., xxvii, pp. 134, 422, 477] was satisfactorily controlled by puratized agricultural spray (phenyl [mercury] triethanol ammonium lactate), but the fungicide delayed flowering and reduced the flower quality of forced bulbs. Although 2 per cent. ceresan is more efficient under test conditions its insolubility renders it less satisfactory and more injurious under commercial conditions.

Spraying tests for the control of *Botrytis* blight [*B. tulipae*: ibid., xxv, p. 115] of William Pitt tulips by C. J. Gould showed that zerlate was almost as effective as fermate, and that sprayed plots produced 11 per cent. more saleable bulbs than unsprayed.

In tests for the control of crown rot of Wedgwood iris bulbs caused by *Sclerotium delphinii* [cf. ibid., xxiii, p. 181] soaking for one hour in a suspension of tersan (1 lb.–12½ gals.) or lime-sulphur (1 pt.–12½ gals.) prior to planting increased the size and weight of bulbs slightly more than the untreated. Very little crown rot was found although the bulbs had come from stock which had suffered severe losses from this. Good control of corm rot of Picardy gladioli (*Sclerotinia gladioli*) [ibid., vii, p. 476] and increased yields were obtained when corms were disinfected immediately after digging or just prior to planting. Arasan dust proves most effective for this purpose. Dr. Bennet corms treated just before planting with dowicide B and dowicide 9-B (zinc trichlorophenate) produced twice as many flowers as the untreated, and in July the number of plants diseased as a result of dry rot was less than one-third of the number among the untreated. Tersan-treated corms produced three times as many flowers and had half the number of diseased plants.

Săvulescu (T.). **Contribution à la classification des Bactériacées phytopathogènes.** [A contribution to the classification of the phytopathogenic Bacteriaceae.]—*Anal. Acad. romîne*, Ser. III, xxii, 4, 26 pp., 1947.

In this study, the author lays down fundamental principles for a classification of the phytopathogenic bacteria. In his view, these organisms do not constitute a distinct group, since their pathogenicity is not a stable generic character. The Gram reaction is considered to be too important a diagnostic character to be ignored and [affords good reason] 'for not conserving the genus *Bacterium*'. The author does not agree with Burkholder that the Gram-positive species should be referred to *Erwinia* or *Pseudomonas*. The lack of flagella in usually peritrichiate or lophotrichiate phytopathogenic bacteria is not considered a generic character. All sporogenous forms whether motile or non-motile should be placed in *Bacillus*. The genus *Pseudomonas* (syn. *Phytomonas*) as hitherto delimited comprises a heterogeneous group which cannot be maintained and is split up as follows: (1) *Agrobacterium* [*R.A.M.*, xxiii, p. 168; xxv, p. 545], including the strict anaerobes (and a few facultative aerobes) which form yellow, white, or greyish-white colonies, (2) *Pseudomonas* [ibid., xviii, p. 659] (including *Phytomonas* Bergey et al. pro parte), curved rods, Gram-negative, asporogenous, generally motile with one or more polar flagella, forming white or yellowish-white colonies; and (3) *Xanthomonas* [loc. cit. and ibid., xxvii, p. 413] (including *Phytomonas* Bergey et al. pro parte) which differs from *Pseudomonas* in that the majority of species contain a yellow pigment and cultures on potato dextrose agar are abundant and mucilaginous.

The genus *Agrobacterium* includes, *inter alia*, *A.* [*Bact.*] *gypsophilae*, *A.* [*Bact.*] *rhizogenes*, *A.* [*P.*] *savastonoi*, *A. tonelliarum* [*P. savastonei* var. *nerii*], *A.* [*Bact.*] *tumefaciens*, *A.* [*Bact.*] *pseudotsugae*, *A.* [*P.*] *mors-prunorum*, *A.* [*X.*] *albilineans*, *A.* [*Bact.*] *tardicrescens*, and *A.* [*Corynebacterium*] *rathayi*.

The genus *Pseudomonas* includes, *inter alia*, *P.* [*Bact.*] *matthiolae*, *P.* [*Bact.*] *mori*, *P.* [*X.*] *solanacearum*, *P.* [*X.*] *stewarti*, *P.* [*Bact.*] *lycopersicum*, *P.* [*Bact.*] *marginata*, *P.* [*Bact.*] *ligustri*, *P.* [*Bact.*] *tomato*, *P.* [*Bact.*] *betle*, and *P.* [*Bact.*] *primulae*.

The genus *Xanthomonas* includes, in addition to those recognized by Dowson, *X.* [*Bact.*] *beticola*, *X.* [*Bact.*] *gummisudans*, *X.* [*Bact.*] *panici*, *X.* [*Bact.*] *rhaponticum*, *X.* [*Bact.*] *dieffenbachiae*, and *X.* [*Bact.*] *heteroceum*.

The genus *Erwinia* [ibid., xxi, p. 282] is divided into three natural groups, (1) comprising *E. amylovora*, *E. tracheiphila*, and *E. salicis*, (2) those species producing wet rots *E. aroideae*, *E. carotovora*, *E. ananas*, *E. citrimaculans*, *E. cytolitica*, *E. erivanensis*, *E. flavida*, *E. phytophthora*, *E. solanisapra*, and *E. carnegieana*, and (3) *E. lathyri*, *E. mangiferae*, and *E. milletiae*.

In the genus *Bacterium* the author includes a heterogeneous collection of rod-shaped, Gram-positive, asporogenous bacteria not falling into any of the genera listed above. It is, therefore, a provisional genus containing insufficiently studied or incompletely described forms. In it seven species can be included falling into two distinct series, (1) *Bact. acerneum*, *Bact. conjac*, and *Bact. proteamaculans*, producing a yellow pigment and nearer to *Xanthomonas*, and (2) *Bact. barkeri*, *Bact. berberidis*, *Bact. viciae*, and *Bact. viburni*, producing a fluorescent-green pigment and nearer to *Pseudomonas*.

The genus *Bacillus* comprises only a few rod-shaped, sporogenous, mostly Gram-positive phytopathogenic bacteria (*B. asteris*, *B. petasites*, and *B. seminum*).

Thus in the sub-order Asporales the author recognizes four families, Rhizobiaceae [ibid., xix, p. 461] containing *Agrobacterium*, Pseudomonadaceae with *Pseudomonas* and *Xanthomonas*, Enterobacteriaceae (Rahn O., *Zbl. Bakt.*, xcvi, Abt. 2, pp. 13–19, 273–286, 1937) including *Erwinia*, and the Bacteriaceae with *Bacterium*. The sub-order Endosporales includes *Bacillus*.

The order Actinomycetales [*R.A.M.*, xxv, p. 321] comprises two families Mycobacteriaceae and Actinomycetaceae; to the former is added *Burkholderiella* Săvul. n. gen. [without a Latin diagnosis] which is distinguished from the other genera in the family by the formation of a pigment appearing in culture as deep blue granules. The only species is *B. insidiosa* (McCulloch) Săvul. (*Corynebacterium insidiosum*).

The paper is followed by tables listing all bacteria pathogenic to plants, with their synonyms, hosts, their morphological and physiological characters, and their pathogenicity. A list is given of a large number of insufficiently known species which have been reported as phytopathogenic, together with their hosts, and which are not included in the author's classification.

WALDEE (E. L.). **Comparative studies of some peritrichous phytopathogenic bacteria.** —*Iowa St. Coll. J. Sci.*, xix, 4, pp. 435–484, 4 figs., 1945.

Cross-inoculation, morphological, cultural, and biochemical studies were made with 78 cultures of peritrichous and non-motile phytopathogenic bacteria of the genus *Erwinia* [see preceding abstract] together with a few non-phytopathogenic bacteria to determine their relationships [*R.A.M.*, xxi, p. 282]. In morphology and staining reactions the plant-pathogenic bacteria were practically indistinguishable from the non-pathogenic species.

The results of the cross-inoculations indicated (*a*) that *E. amylovora* and *E. tracheiphila* are highly host specific in comparison with the pectolytic bacteria; (*b*) that the pectolytic or soft rot organisms, all of which caused a visible softening of inoculated carrot slices within 48 hours, are able to attack a relatively wide range of host plants by virtue of their protopectinase activity; (*c*) that the virulence

of the pectolytic bacteria on potato plants is not correlated with their ability to produce blackleg symptoms [*E. phytophthora*]; (*d*) that cultures designated as non-pathogenic soft rot or blackleg bacteria (including several received as *E. carotovora*, *E. phytophthora*, and *E. solanisapra*) are usually readily identified as coliform organisms; (*e*) that the maize stalk rot bacteria (*E.* [*Bacterium*] *dissolvens*) are not pectolytic bacteria; and (*f*) that two cultures of yellow organisms received as *E. lathyri* from England are probably not the same as the one described by Manns in 1915 [*Bull. Del. agric. Exp. Sta.* 108] and appear to be closely related to *Serratia marcescens*.

A new family, Erwiniaceae, is proposed to include the emended genus *Erwinia* conceived as a unit consisting of *E. amylovora*, *E. tracheiphila*, and *E. salicis* and excluding the pectolytic and all other bacteria that do not conform to the behaviour outlined below. The genus *Erwinia* is emended as follows: heterotrophic, Gram-negative, non-spore forming, rod-shaped bacteria, motile by means of peritrichous flagella or non-motile; usually require organic nitrogen compounds for growth in laboratory culture media; produce acid with or without small amounts of gas from a restricted number of carbon compounds in buffered peptone media; habitat living plants; type species *E. amylovora*.

It is further proposed to segregate the pectolytic bacteria which are shown in these studies to be totally unrelated to the genus *Erwinia* as emended, together with the coliform bacteria, in the new genus *Pectobacterium* belonging to the family Enterobacteriaceae. The new genus is described as follows: non-spore-forming, Gram-negative rod-shaped bacteria which are motile by means of peritrichous flagella or non-motile; grow readily in media containing inorganic nitrogen compounds and appropriate carbon source; reduce nitrates to nitrites; in buffered peptone media produce anaerogenic or micro-aerogenic acid fermentation (gas none to 10 per cent.) from a wide range of substrates; secrete an active protopectinase capable of producing a visible softening of raw carrot (or other fleshy plant tissue) within 48 hours or less; produce active gelatinase; and acidify litmus milk without digestion. It comprises *P. carotovorum* (Jones) n. comb. (syn. *Bacillus carotovorus* Jones) the type species, *P. phytophthorum* (syn. *Erwinia phytophthora*), *P. aroideae* (syn. *E. aroideae*), *P. melonis* (syn. *E. melonis*), and *P. delphinii* n. sp.

The new species which causes bacterial blight of rocket larkspur (*Delphinium ajacis*) [ibid., xvii, p. 604] is characterized by its micro-aerogenesis in glucose, galactose, cellobiose, trehalose, lactose, and sucrose; inability to ferment glycerol; slow and rather weak fermentation of maltose; inability to grow in Koser's citrate medium; a positive methyl red reaction and a negative Voges–Proskauer reaction. In nutrient-agar cultures, growth was moderately luxuriant, greyish-white to cream-coloured, raised, smooth shining to dull, and butyrous. Potato dextrose agar induced a copious and cream-coloured growth and prolific anaerobic growth was obtained in all peptone-containing culture fluids.

Since the maize stalk rot organism, *Bact. dissolvens*, was shown in comparative studies to differ from the pectolytic bacteria in its absence of protopectinase or gelatinase activity and resembled the species of *Aerobacter* in all respects except that it produced a strikingly low microaerogenic fermentation from lactose, the species is transferred to this genus as *A. dissolvens* (Rosen) n. comb.

Verona (O.). **La costituzione chimica dei batteri in rapporto alla funzione patogena e la costituzione chimica delle piante in rapporto al grado di resistenza da esse offerto alle infezioni batteriche.** [The chemical constitution of bacteria in relation to their pathogenic function, and the chemical constitution of plants in relation to the degree of resistance displayed by them to bacterial infections.]—Reprinted from *Ann. Biol. norm. pat.*, iii, 7 pp., 1947.

The author briefly refers to the known facts about the chemical constitution of

bacteria and puts forward the view that the complex syndrome resulting from the process of infection is to be regarded as a sum-total of partial syndromes each of which appears to be related to the action of the separate principles contained in the bacterial cell. Any change in pathogenicity must be related to some variation in the active substance or group of substances determining the pathological process. The proteins appear to be very important in this respect. Some putrefying bacteria which produce proteolytic enzymes are able to cause softening and rotting in plants which contain a large amount of nitrogen. These organisms are mostly saprophytic, though becoming capable of attack if they find suitable conditions within the host. Any variation in their proteolytic activity induces a variation in their ability to attack the host. When *Bact.* [*Pseudomonas*] *fluorescens* and *Bact. pyocyaneum* were grown in peptonized meat agar, they became able to cause a rotting of cabbage [cf. *R.A.M.*, xxvii, p. 413]. Other examples are *Bact. carotovorum* [*Erwinia carotovora*], whose action is due to pectases, and *Bact. amylobacter*, whose effects are related to enzyme production. The lipides and carbohydrates present in the cells of bacteria also bear an important relation to the mechanism of aggression. The pathogenicity of *Bact. tumefaciens* has been found due to a glucose-lipide substance. All the evidence shows that the chemical constitution of phytopathogenic bacteria appreciably affects their degree of pathogenicity.

The resistance to bacterial attack also varies with the presence or absence of certain constituents in the host, particularly mineral elements [cf. ibid., xviii, p. 127; xxvi, p. 236]. Potassium is very important in this respect, particularly in relation to attack by *Bact. tumefaciens* [ibid., xi, p. 358; xviii, p. 729].

Posnette (A. F.) & Strickland (A. H.). **Virus diseases of Cacao in West Africa. III. Technique of insect transmission.**—*Ann. appl. Biol.*, xxxv, 1, pp. 53–63, 1948.

The results of experiments on the transmission of the cacao virus I A (swollen shoot) [see above, p. 508, and next abstract] by mealy bugs, using 10- to 12-month-old test plants, germinating seedlings, and cacao beans [ibid., xxvi, p. 384], indicated that all stages of *Pseudococcus njalensis* and of *Ferrisia virgata* can transmit the virus. The insects became infective after feeding for less than four hours on the diseased material and transmitted the virus after less than three hours' feeding on a healthy plant, after which the virus is non-persistent in the vector. Young leaves showing symptoms provide the best source for infection-feeding, while bean cotyledons are best for test-feeding. The latent period ranged from 17 to 69 days for 10- to 12-month-old plants, 31 (mean) for 3- to 5-week-old seedlings, and 17 to 25 for inoculated beans. For plants or seedlings 30 per cent. transmission was all that could be expected with five mealy bugs per plant, but, using beans, 100 per cent. infection was not uncommon, with a mean of 55 per cent. for all feeding sites.

Voelcker (O. J.). **Annual Report West African Cacao Research Institute. April 1946 to March 1947.**—70 pp., 1948.

In the section of this report [cf. *R.A.M.*, xxv, p. 546] dealing with cacao virus diseases in West Africa (pp. 11–29) it is stated that the symptoms of several new strains of swollen shoot disease [see preceding abstract] were determined during the year. Experimental evidence indicates that complete protection against strain A is afforded by attenuated strain A, and by strains H [ibid., xxv, p. 441] and K. Strains H and K resemble A in the details and sequence of leaf symptom-expression but are slightly less virulent. Incomplete protection is afforded by strain B against A, the appearance of the symptoms of A being delayed and the latency period doubled or trebled. Infection by strains C, F, or J, on the other hand, affords no protection against A, either in the latent period or in the acute and

chronic phases. In plants infected by strain M, on which strain A infection is later imposed, each virus appears to follow its own course of phasic development regardless of the other. Occasionally, a leaf symptom typical of neither strain develops, and is assumed to be the visible result of the formation by coincident development of a localized complex. This was ascertained to be transmissible intact by *Pseudococcus njalensis*.

Further work on coppicing trees affected by strain A demonstrated that this strain varies in virulence, usually slightly, but occasionally widely, from one infected tree to the next in the same outbreak. There appears to be no need to postulate that attenuation is induced by coppicing.

Experimental evidence also indicated that there are three main types of 'resistance' (*sensu lato*) to severe strain A. The first is passive tolerance, and the virus continues to be harboured in its full virulence by the host. Such tolerance does not appear to be common, and is not known to be characteristic of an entire clone. The second type of resistance is one of active tolerance; this is usually a clonal property and is characterized by the ability of the plant to cause a reaction in its tissues whereby introduced severe strain A is so changed that an attenuated strain becomes the predominant infecting virus. The third type, acquired resistance, can be induced in any cacao plant by artificial infection with the attenuated strain.

The term 'attenuated strain' has been used in the singular only as a matter of convenience, but strain A should be regarded as a graded complex comprising an infinite series of sub-strains ranging in their effects from very severe to very mild. Attenuated strains do not produce a continuous sequence of leaf symptoms nor do they cause necrosis or defoliation. Experiments, as yet incomplete, appear to indicate that attenuation occurs not earlier than the chronic phase of infection. Strain A was transferred from infected cacao seedlings to *Theobroma bicolor* by approach-grafting, and with mealy bugs; *Bombax buonopozense* seedlings under the treatment developed virus-like symptoms. Transfer of mealy bugs to cacao from three plants of *Cola chlamydantha* showed the latter to be infected with swollen shoot virus.

The rate of spread of swollen shoot (strain A) and the resultant decline in yield are being studied on eight acres of station cacao where no control has been adopted. In August, 1945, 31 per cent. of the trees were infected, while by March, 1947, the number had increased by 24 per cent. (made up from numerous independent outbreaks) with a 19 per cent. reduction in yield. Spread in the outbreaks varied from 10 to 100 per cent., the variation being due, apparently, to variation in vector populations. In single, circumscribed outbreaks, centrifugal spread rarely occurs uniformly over the whole perimeter, and most outbreaks tend to become more amoeboid than circular.

Experiments established that *P. citri* can take up strain A after less than four hours' feeding on an infected plant and can transmit it to a healthy plant in less than three hours, after which the vector is no longer infective. If starved the vector can remain infective for at least five hours.

Control of the spread of swollen shoot by cutting out infected cacao trees has been proved. In some outbreaks this method gives complete control, though in others it has not prevented re-infection. This may be caused by ingress of infective vectors from cacao or from infected alternate hosts. Cacao can be successfully re-established on farms devastated by the disease, provided the soil is suitable. If all affected cacao trees are first removed, incidence on the young, re-established cacao is small.

In the section dealing with mycology (pp. 58–61) it is stated that much of the damage to cacao formerly ascribed to insect attack has now been demonstrated to be due to subsequent infection by *Calonectria rigidiuscula* [ibid., xxvi, p. 537; xxvii, p. 80].

Thomas (I.). **Wheat variety trials.**—*J. Dep. Agric. W. Aust.*, Ser. 2, xxv, 1, pp. 84–94, 4 figs., 1948.

The Department of Agriculture registered two new wheat varieties tested in variety trials in Western Australia: Wongoondy (Eureka × Bungulla), tested as M. 80 [*R.A.M.*, xxvii, p. 12] and possessing the Eureka type of resistance [loc. cit.], and Dowerin (M. 71) (Sword × Kenya C. 6041) resistant to all known races of stem [black] rust [*Puccinia graminis*] in Australia. The other new varieties mentioned have already been noticed from another source [loc. cit.].

Dunne (T. C.) & Throssell (G. L.). **Responses of Wheat to copper and zinc at Dongara.**—*J. Dep. Agric. W. Aust.*, Ser 2, xxv, 1, pp. 43–46, 1948.

In a fertilizer trial conducted at Dongara, Western Australia, in 1947, considerable wheat yield increases were obtained when copper and zinc were used individually with superphosphate and even a more striking response was achieved when both minerals were used in combination with the latter.

Dunne (T. C.). **Copper deficiency of cereal crops in Western Australia.**—*J. Dep. Agric. W. Aust.*, Ser. 2, xxv, 1, pp. 76–81, 2 figs., 1 map, 1948.

This is a brief review of papers dealing with copper deficiency of cereals in Western Australia and the use of copper fertilizers, most of which have already been noticed [*R.A.M.*, xxii, pp. 17, 37, 246, and preceding abstract].

Prasada (R.). **Reactions of certain varieties of Hordeum to Indian physiologic races of Puccinia triticina Erikss.**—*J. Indian bot. Soc.*, xxvi, 4, pp. 213–219, 1 pl., 1948.

At the Agricultural Research Institute, New Delhi, results of greenhouse tests in which 90 varieties of barley [*R.A.M.*, xxvi, p. 293] were inoculated in the seedling stage with a mixture of uredospores of the six Indian races of wheat leaf [brown] rust (*Puccinia triticina*) [ibid., xxvii, p. 314] showed that the varieties Pusa I-108, Pusa III-620-24, Pusa 12 × Plumage Hybrid I, and Pusa 12 × Plumage Hybrid II were moderately to heavily infected and bore several fairly large pustules but were not so heavily infected as the wheat varieties Malakoff, Brevit, Webster, or Laros. Sixteen varieties showed intermediate reaction and the rest were resistant. Agra wheat seedlings were infected by inoculation with uredospores from barley. These results show that susceptible oversummering barley seedlings are capable of carrying over *P. triticina* to the next wheat crop in the hill regions.

Lansade (M.). **Sur le traitement du charbon de l'Avoine.** [The treatment of loose smut of Oats.]—*C. R. Acad. Agric. Fr.*, xxxiv, 7, pp. 583–588, 1948.

An increase in the incidence of loose smut of oats (*Ustilago avenae*) [*R.A.M.*, xxvi, p. 196] was observed in France from 1945 to 1947, infection reaching 15 to 30 or even 50 per cent. of the panicles in some instances. Experiments in control in 1947 resulted in 13 and 25·2 per cent. infection in untreated controls of lots sown on 4th and 19th April, respectively. Some lots in the second sowing sustained up to 48·5 per cent. smut. All traces of infection were suppressed by soaking the seeds in formalin at the rate of $\frac{1}{3}$ l. of commercial solution per 100 l. water and stirred for about 20 minutes [ibid., xxvi, p. 294]. Dusts with a trioxymethylene base and high active ingredient and the better-known organic mercury products [loc. cit.] were also effective, whilst a number of others were unsatisfactory.

Guyot (L.), Massenot (M.), Montégut (J.), & Saccas (A.). **A propos de la rouille jaune des Graminées (Puccinia glumarum).** [On the subject of the yellow rust of Gramineae (*Puccinia glumarum*).]—*C. R. Acad. Sci., Paris*, ccxxvii, 1, pp. 83–85, 1948.

Eriksson and Henning's subdivision of *Puccinia rubigo-vera* into sections based

on the linear disposition of the uredosori has been unanimously accepted by rust specialists in all countries, but it appears to call for some comment in the light of recent studies. Thus, in 1940, Viennot-Bourgin observed that in the early stages of infection by yellow rust *P. glumarum* on *Hordeum murinum* and wheat, the uredosori are scattered at random on the young leaves and not in the regular series of lines supposedly typical of the species, the latter arrangement being followed only in the case of the secondary sori. The linear disposition of the teleutosori also is not specific to *P. glumarum*, certain brown rusts, e.g., *P. bromina* on *Bromus*, *P. persistens* on *Agropyron*, and *P. triticina* on wheat, sometimes forming both uredo- and teleutosori in linear series.

The colour of the uredosori varies considerably in *P. glumarum*. Designated by Eriksson and Henning as lemon-yellow (light cadmium), the following shades have been differentiated by the writers, using E. Séguy's universal colour code: 196 (orange), 211 (neutral orange), and 246 (ochreous clay). Similarly, the colours of the brown rusts have been found to range from rust- to orange- or even yellowish-brown (171 to 196 in *P. bromina*, 172 to 187 in *P. persistens*, and 172 to 196 in *P. triticina*). The colour of the uredosori, like their dimensions and arrangement, depends on the age of the host tissues: on one occasion the authors observed fairly large (up to 2 mm.) dead-leaf coloured (191) uredosori of *P. triticina* irregularly scattered over the green leaves, and small, orange (196) ones (up to 0·5 mm.), more or less aggregated or even disposed in regular lines on the yellowing or withered foliage of the same host.

Some forms of brown rust fructify, like those of *P. glumarum*, on the pedicels, glumes, and awns. Eriksson and Henning mention this character in connexion with *P. bromina* on *B. mollis*, and the writers have often noticed it in the same species on *B. sterilis*.

The number of germ pores in the wall of the uredospores is another variable character both in the yellow and brown rusts, having been computed for *P. glumarum* at 4 to 6 by Eriksson and Henning, at 8 to 10 (or up to 12) by Fischer, at 10 to 15 by Arthur, at 10 to 16 by Allen. Viennot-Bourgin has estimated the numbers according to hosts as follows: 7 to 11 (or up to 12) on wheat, 5 to 12 on wild barleys, 7 to 11 (mostly 9) on cultivated barleys, 5 to 12 on *Agropyron*, 6 to 11 or 7 to 13 on *Bromus*, 6 to 11 (rarely 13 to 14) on *Dactylis*, 9 to 10 on *Arrhenatherum*, and 10 to 12 on *Calamagrostis*. The authors have counted 9 to 11 (7 to 13) germ pores of *P. glumarum* on *Aegilops*.

The teleutospore dimensions present as marked a variability in the case of *P. glumarum* as in that of the diverse brown rusts. Viennot-Bourgin found no well-defined difference in the teleuto stage between *P. glumarum* and *P. bromina* on *Bromus*, while the authors have noted a very distinct resemblance in certain races of *P. bromina* (notably on *B. sterilis*) to *P. glumarum*, both in the uredo and teleuto phases. Moreover, *P. hordei-maritimi* is almost identical in the teleuto stage with *P. glumarum* on wild barleys.

Ekstrand (H.). **Höstsädens och vallgräsets övervintring.** [Overwintering of autumn-sown cereals and meadow grasses.]—*Lantmannen, Uppsala*, xxxi, p. 1043, 1947. [Abs. in *Herb. Abstr.*, xviii, 2, p. 84, 1948.]

Considerable differences have been found in the resistance shown by varieties and strains of both autumn-sown cereals and meadow plants to various fungus diseases which cause dying-out during the winter [*R.A.M.*, xxvii, p. 416] such as *Typhula* sp., *Sclerotinia borealis*, and snow mould [*Calonectria nivalis*: loc. cit.]. For wheat, which is more susceptible to cold than rye, it is especially important that non-infected or treated seed should be used.

Experiments conducted in Sweden and Finland indicate that phosphoric acid increases the power of resistance to winter killing fungi.

Martin (J. P.) & Joseph (Harriet Ann). **Some observations of fungus flora of California Citrus soils.**—*Calif. Citrogr.*, xxxiii, 5, pp. 198–200, 2 figs., 1948.

To determine the soil changes caused by prolonged citrus cultivation and their effect on plant growth, a great number of citrus soil samples from southern California were compared with non-citrus ones. About 83 species of fungi representing 41 genera were isolated from the samples, the majority of forms occurring in both soils. There were, however, some differences. The most common fungus isolated from the root zone of citrus trees was a *Fusarium* sp., designated as *Fusarium* sp. 1 (occurring in much greater numbers in old citrus soils), followed by fungus D 1 (unidentified) and *Pyrenochaeta* sp., not found in the non-citrus samples. Of the various species of *Fusarium* isolated from sterilized citrus feeder roots, *Fusarium* sp. 1 was again the most common. A solid mass of the fungus developed in isolation plates from roots showing nematode injury. The blue to purplish-blue discoloration frequently observed in the inner portion of the bark or on the entire nematode infested roots is undoubtedly caused by the fungus. *Fusarium* sp. 1, which appears to grow in close association with citrus roots, probably does not attack them when they are healthy, but if they are injured or weakened by other factors may cause further damage. When grown on plates it produced a substance antibiotic to other fungi. Citrus cuttings died rapidly if placed in a medium in which *Fusarium* sp. 1 had grown.

It is concluded that citrus growth influences the nature of fungus soil flora, which, directly or rather in association with other factors, may have a harmful effect on the growth of the trees.

White (F. A.). **What is to be done about dry bark?**—*Calif. Citrogr.*, xxxiii, 5, pp. 182, 212, 1948.

To solve the problem of dry bark of lemon trees in California [*R.A.M.*, xxvii, p. 232] the author suggests major changes in nursery practice. Nurserymen should grow special trees with the purpose of producing large quantities of budwood. The trees should be used for propagation when old enough to prove their resistance to the disease and pruned to produce a maximum of good budsticks. Individual records of all parent trees should be kept, followed by a registration with the State Department of Agriculture. Close co-operation between growers and agricultural organizations is also emphasized.

Fawcett (H. S.) & Wallace (J. M.). **Symptomless hosts of quick decline virus.**—*Calif. Citrogr.*, xxxiii, 5, p. 182, 1948.

In California in July, 1946, buds were taken from two symptomless Valencia orange trees on sweet orange stock and from one Navel orange on sweet orange stock, all growing in close proximity to Valencia sour orange root trees severely affected with quick decline [*R.A.M.*, xxvii, pp. 132, 233] and placed as inoculum into the sweet tops of some Valencia trees on sour root, and into the sour rootstock of others. Some of the test trees showed a degeneration of the bud-union tissues seven months after inoculation. The first characteristic symptoms of the disease were observed after nine months, and top symptoms developed after 11 months. In January, 1948, nearly one-half of the inoculated sweet top trees showed symptoms, while inoculations into the sour rootstock resulted in less infection, or at least in slower symptom development. All control trees remained healthy.

These results indicate that even though symptomless, orange trees on sweet orange rootstocks can become infected in the field and can serve as carriers of the quick decline virus.

Fawcett (H. S.) & Klotz (L. J.). **Bark shelling of trifoliate Orange.**—*Calif. Citrogr.*, xxxiii, 6, p. 230, 2 figs., 1948.

A condition of trifoliate orange [*Poncirus trifoliata*] known as exocortis occurs as a type of bark shelling more nearly resembling shell bark of lemon [*R.A.M.*, xxvii, p. 183] than scaly bark (psorosis) of oranges [ibid., xxvi, p. 298] but is apparently different from either. Narrow strips of outer bark become dry, separate from the inner live bark, and slowly peel off in strips varying from 1 to 5 in. long, $\frac{1}{8}$ to $\frac{3}{4}$ in. wide, and $\frac{1}{16}$ to $\frac{1}{8}$ in. in thickness. In a trifoliate orange tree growing on grapefruit stock in California the entire trunk above the bud union was so affected, with initial longitudinal cracking evident on the larger branches. The association of marked dwarfing with exocortis has been observed in the case of grapefruit, navels, and Valencias on trifoliate orange rootstock, although the growth of trees grafted on to this stock is normally restricted. The trunks of two 23-year-old navel trees at the Citrus Experiment Station, Riverside, above the bud union are half the average diameter of 20 other trees with normal trifoliate stocks and the volume of the affected top is about one fifth that of the normal top. It is believed that the condition is due either to a genetic factor or to a virus, but until the nature of the disease is known the propagation of budwood and the use of seeds from trifoliate trees or from trees on trifoliate stock showing exocortis symptoms should be avoided.

Haas (A. R. C.). **Magnesium deficiency and its effect on Citrus.**—*Calif. Citrogr.*, xxxiii, 4, pp. 134, 146–148, 150, 4 figs., 1948.

These investigations were made in order to draw the attention of citrus growers to the rise in magnesium deficiency [*R.A.M.*, xxi, p. 524; xxiii, p. 482] in an increasing number of California orchards during recent years. The studies showed that in the Hemet area mature magnesium-deficient grapefruit and orange leaves contained 0·042 and 0·041 per cent. magnesium, respectively, and were also deficient in calcium but contained excess potassium. The percentages of calcium, magnesium, and potassium found in the healthy appearing mature leaves from trees showing deficiency symptoms were quite different from those usually found in healthy leaves of unaffected trees where the normal magnesium content is 0·3 per cent. or more. Grapefruit trees with iron chlorosis were also deficient in magnesium. In the Bryn Mawr area, in affected navel orange leaves the magnesium content was only 0·039 to 0·045 per cent. compared with 0·156 to 0·214 per cent. in apparently healthy leaves from magnesium-deficient trees, and the potassium content was again very high (nearly 2 per cent.). In the Santa Paula area affected mature lemon leaves contained approximately normal amounts of calcium and potassium but were very low in magnesium and phosphorus. These analyses show that when the magnesium values are low the values for other elements may also differ considerably from normal and that magnesium-deficient trees may also bear affected but symptomless leaves.

Further analyses in several different areas showed that magnesium-deficient trees occur in widely scattered areas under a variety of conditions and on fairly heavy soils as well as on open soil types.

Although the addition of nitrogen or other fertilizers may decrease the symptoms to a certain extent this is no guarantee that the trees have recovered completely. Magnesium deficiency symptoms may be masked by another leaf symptom such as iron chlorosis. In some cases the soluble magnesium and other nutrient elements were leached away by too many trees being planted in an irrigation run or by heavy rainfall on open soils in some seasons. Certain well waters in the Coachella Valley are known to be extremely low in magnesium.

The phosphorus content of magnesium deficient orange and lemon leaves from several localities was always less than that of apparently healthy leaves from the

same trees. A similar phosphorus reduction was noted in the peel and pulp of fruit from magnesium-deficient navel orange trees. Both the leaf and fruit analyses showed that the phosphorus content was greater when nitrogen was not a limiting factor. It appears, therefore, that magnesium may be of importance in the phosphorus nutrition not only of the leaves but of the fruit.

Typical magnesium deficiency symptoms appeared on the leaves of trees leached each day with large quantities of nutrient solution containing various concentrations of nitrate. As the nitrogen concentration was increased, so did the calcium and magnesium content, while potassium and phosphorus were reduced. Decreased nitrogen decreased the magnesium content and increased the phosphorus. High potassium was associated with the reduction in the calcium and magnesium values [ibid., xxvii, p. 370].

The addition of 5 to 25 lb. magnesium sulphate and 5 lb. euramon to the soil around 24 Valencia orange trees near Pala gave marked improvement. By supplying dolomite in sufficient amounts to hold the soil at pH 6, the necessary amount of soluble magnesium (100 to 300 lb. per acre according to tree size) should be available.

Castellani (E.). **La scabbia delle Arance in Eritrea.** [Orange scab in Eritrea.]—*Riv. Agric. subtrop. trop.*, xlii, 7–9, pp. 145–150, 3 figs., 1948. [English summary.]

The author draws attention to the fact that sweet orange scab (*Elsinoe australis*) [*R.A.M.*, xxi, p. 369; xxii, p. 354; xxvi, p. 304] has now been found in Africa, diseased material having been received from Cheren, Eritrea. It is thought that infection was probably introduced during the war on oranges sent from South America.

Mandarin roots are tristeza free.—*Calif. Citrogr.*, xxxiii, 4, p. 163, 1948.

Following a visit to Concordia, Argentina, to observe progress in tristeza investigations, Dr. A. F. Camp reports that a 5-acre citrus grove on Cleopatra mandarin rootstock [*R.A.M.*, xxvii, p. 131] planted nine years ago has remained quite healthy while blocks of trees on sour orange rootstock nearby became worthless when tristeza swept the area between 1940 and 1943 [ibid., xxi, p. 485].

Bartholomew (E. T.), Sinclair (W. B.), & Turrell (F. M.). **Granulation of Valencia Oranges.**—*Calif. Citrogr.*, xxxiii, 7, pp. 322–325, 1948.

This is a summary of available information concerning granulation of Valencia oranges in California [*R.A.M.*, xxiv, p. 97; xxvi, p. 242], using the term granulation for a condition in which the fruit sacs at the stem-end of the fruit become enlarged, hardened, and light grey in colour, and distinct from dry juice sac (blossom-end granulation) in which the sacs become soft and shrunken. It is recommended that large fruits, especially those on the north and inside of the trees should be picked early and buds for new plantings taken from trees that were low producers of granulation when they were young. Limited tests in Orange County have shown that the amount and severity of granulation may be noticeably diminished by reducing to a minimum the amount of irrigation water supplied. Similar results in this direction have been obtained in Florida and Australia. The disorder is present wherever citrus is grown and has been described and reported (verbally) from Palestine, Egypt, India, Siam, China, Mexico, British West Indies, Honduras, Brazil, South Africa, Australia, and Russia.

Van Der Plank (J. E.). **The use of hypochlorous acid and its salts in Citrus packhouses for bleaching sooty blotch and as disinfectants against mould.**—*Sci. Bull. Dep. Agric. S. Afr.* 241, 60 pp., 3 figs., 7 graphs, 1945. [Received April, 1948.]

In this study the author gives a detailed account of his investigations into the use of hypochlorous acid and its salts in citrus packhouses for removing sooty

blotch [*R.A.M.*, xx, p. 252] and as disinfectants against mould (*Penicillium digitatum*) of oranges [ibid., xx, p. 53]. Sooty blotch of citrus has previously been ascribed to *Gloeodes pomigena* but Dr. G. R. Bates (*in litt.* 1941) states that the fungus on navel oranges from the eastern Transvaal is *Stomiopeltis citri* [ibid., xxvi, p. 95]. Sooty blotch was first found in the damper areas of the northern and eastern Transvaal, along the Natal coast, and round Pietermaritzburg, which remain the most severely affected localities, though the condition occurs also in the eastern Cape and in Southern Rhodesia. The movement of nursery stock and fruit would appear to have carried infection to nearly every part of South Africa, and the absence of infection of commercial significance is due probably more to the absence of conditions favourable to the fungus than to freedom from centres of infection. The fungus requires moist climatic conditions being wholly superficial and unable to invade the rind and draw water from the fruit. It often follows the course of dew-drops and so causes 'tear staining'. It also requires warmth, and damage is worse in the hotter and wetter parts of the summer-rainfall area. Navel oranges are usually more severely affected than Valencias but this difference is probably due to the fact that in summer-rainfall areas navel oranges mature at the end of the wet season, and Valencias in the cooler, drier atmosphere of winter.

For the removal of sooty blotch the author recommended mixtures of bleaching powder and sodium bicarbonate [ibid., xx, p. 200]. These are highly reactive and very economical, and should be used only at low concentrations. The various modifications of the bleaching powder and calcium hypochlorite treatments which have been recommended are described and reviewed. Preparations of calcium hypochlorite now on the market make good substitutes for bleaching powder but are more expensive. The author suggests that solutions of sodium hypochlorite at acidities suitable for bleaching might be prepared from chlorine, sodium hydroxide, and sodium carbonate. A method for calculating the acidity of such mixtures is given. The vapours of alkyl hypochlorites and chloramines although not tested against sooty blotch might be promising where disinfection is important.

With solutions prepared from constant proportions of bleaching powder, sodium bicarbonate, and sodium carbonate the average time required to remove sooty blotch is inversely proportional to the concentration of available chlorine. At constant pH there is a departure from simple inverse proportionability and is probably a 'salt effect'. The rate of bleaching increases about 1·5 times for every 10° C. rise in temperature of the solution, this being more or less constant over the whole range studied (21·7° to 46·1°).

The effect of acidity was determined for a series of solutions ranging from 0·1 to 0·8 per cent. available chlorine. From pH 7·6 to 9·8 the effect was uniform, the time required for bleaching being doubled for every increase of 1·4 in pH. Below pH 7·6, the effect of acidity was smaller, disappearing almost completely at pH 6, at which point hypochlorites exist almost completely as free undissociated hypochlorous acid.

Figures are presented for the effect of acidity, concentration, and temperature on the stability of hypochlorite solutions. Active types of bleaching solution are not stable at ordinary temperatures when the available chlorine concentration greatly exceeds 0·1 per cent. Higher strengths are often desirable, but their use involves spontaneous decomposition. Strengths of 0·5 to 0·7 per cent., sometimes useful for disinfection, are stable only if the pH is raised to 8·5 or, with solutions heated to 48°, to 9·2. Photochemical decomposition of hypochlorite bleaching solutions is not important in the packhouse, but loss of strength through contact with corroding metal surfaces needs attention. Different types of mechanically and manually operated bleaching plants are described. Examples show that the cost of bleaching in Southern Rhodesia and South Africa is only a small fraction of one penny per export case of oranges.

P. digitatum is responsible for about 92 per cent. of the rotting of navel oranges in South Africa. It is used for all tests for assessing fungicidal activity. The spores in suspension are rapidly killed by very dilute solutions of sodium hypochlorite; against spores in wounds, however, sodium hypochlorite is rather ineffective even at high concentrations, and the acidity of the solution has no appreciable effect. The presence of boric acid or borate in sodium hypochlorite solutions greatly increases their value as wound disinfectants.

Kovachich (W. G.). **A preliminary anatomical note on vascular wilt disease of the Oil Palm (Elaeis guineensis).** —*Ann. Bot., Lond.*, N.S., xii, 47, pp. 327–329, 1 pl. (p. 330), 1948.

Anatomical studies at Manchester University of material from oil palms suffering from vascular wilt disease in the Belgian Congo and Nigeria [*R.A.M.*, xxvi, p. 103] were made to determine the distribution of the pathogen in the tissues and the consistency with which it can be demonstrated in the vessels of wilted plants. The presence of chlamydospores and of conidia resembling the microconidia of *Fusarium oxysporum* support the view that this is the causal fungus. The pathogen was not seen outside the vascular bundles. Gum and tyloses were present in necrosed vessels but mycelium was not always associated with this condition.

Arndt (C. H.), Blank (L. M.), Epps (J. M.), Hawkins (B. S.), Hooton (D. R.), Lehman (S. G.), Neal (D. C.), Presley (J. T.), Ray (W. W.), Rogers (C. H.), Simpson (D. M.), Smith (A. L.), & Young (V. H.). **Summary of co-operative tests of Cotton seed treatments —1947.**—*Plant Dis. Reptr, Suppl.* 175, pp. 87–94, 1948. [Mimeographed.]

In 1947 the efficacy of seven cotton seed treatments [*R.A.M.*, xxvi, pp. 450, 574] was tested on lots of reginned, acid-delinted, and fuzzy Coker 100-WR seed naturally infested by anthracnose (*Colletotrichum* [*Glomerella*] *gossypii*) in 21 plantings in 11 of the United States. Special plantings were also made in North and South Carolina to compare ceresan M at 3 gm. per kg. with dosages of seedox at 1, 2, and 3 gm. per kg. and dow 9B at 2, 3, and 4 gm. per kg. on fuzzy and reginned seed and one dosage on delinted seed (in South Carolina only). The results are tabulated in some detail. In the regional tests the mean emergence for each kind of untreated seed was about 36 to 38 per cent. while the dry application of ceresan M to fuzzy and reginned seed gave a mean of 59 and 55 per cent., respectively, slightly higher than that for dow 9B or seedox which gave comparable results. Although the dry and slurry application of ceresan M gave significantly better results than the other materials in several cases, there was no evidence to indicate that any benefit was derived from applying ceresan M to cotton seed by the slurry method except by its reducing the risk of poisoning. The special dosage tests in North and South Carolina indicated that seedox and dow 9B are most effective at the 3 gm. dosage. No fungicide, however, proved consistently superior to the others throughout the tests for all kinds of seed under all field conditions.

Twentieth Annual Report of the Agricultural Research Institute of Northern Ireland, Hillsborough, Co. Down, 1946–47. 32 pp., [? 1948. Abs. in *Plant Breed. Abstr.*, xviii, 2, p. 330, 1948.]

The results of field tests conducted in Northern Ireland indicated that while certain fibre flax varieties showed some resistance to *Polyspora lini* [*R.A.M.*, xxvii, p. 236], all were susceptible to *Phoma* sp. [loc. cit.]. A few oil-producing varieties possessed a high degree of resistance to both diseases, but none was immune.

Chowdhury (S.). **A Cercospora blight of Jute.**—*J. Indian bot. Soc.*, xxvi, 4, pp. 227–231, 1 pl., 2 figs., 1948.

In 1945, a leaf spot disease due to a species of *Cercospora* was observed in jute plots at Sylhet and in the field at Rainagar, Akbarpur, and Inathganj. The initial, minute, dark brown spots gradually became darker and larger until they were 4 to 14 mm. in diameter, and roughly circular. Two or more spots sometimes coalesced to form large, irregular lesions. The disease spreads from the lower to the upper leaves and when heavily attacked they turn yellow and fall, sometimes while still quite young. On the stems and capsules the dark spots are of diverse shapes; the fibres are discoloured.

Single-spore isolations from diseased leaves, stems, and seed capsules grew well on oat meal, maize meal, and potato dextrose agars, but under a variety of conditions no sporulation was observed.

Inoculation experiments were made by spraying healthy plants with inoculum prepared by macerating mycelium and agar in water and keeping them under glass for 48 to 96 hours; by placing conidia-bearing leaves on healthy plants; and by placing bits of the cultured fungus on leaves, stems, and fruits in the field and occasionally spraying with sterile water. In every case 100 per cent. infection was obtained and initial symptoms appeared in 4 to 6 days using the third method of inoculation. Sporulation occurred on all the inoculated plants; the fungus was re-isolated many times and produced the disease when re-inoculated into healthy plants.

The conidia of the fungus are hyaline, 32 to 117 by 3 to 5 μ and 2- to 7-septate; with conidiophores 24 to 79 by 4 to 6 μ and 0- to 3-septate, and it is considered to be identical with *C. corchori*, the first record of the occurrence of this fungus in India.

Plant diseases. Diseases of Daffodils.—*Agric. Gaz. N.S.W.*, lix, 2, pp. 83–86, 7 figs., 1948.

Basal rot (*Fusarium bulbigenum*) [see above p. 512] is at present the most destructive disease of daffodils [*Narcissus pseudo-narcissus*] in New South Wales. If the disease is suspected in the crop, the bulbs should be lifted as soon as the leaves yellow off naturally, dried, cleaned, soaked for two hours in formalin solution (1 pint to 25 gals. water) [*R.A.M.*, xxiii, pp. 133, 344], thoroughly dried out, and stored in a cool dry place. Any diseased specimens should be burned before planting and diseased soil should not be planted to daffodils again for about five years. Annual inspection and treatment with formalin is advised until the disease has been eliminated. Since they encourage the disease the use of hormone preparations and heavy dressings of nitrogenous fertilizers should be avoided.

There appear to be two virus diseases of daffodils in New South Wales, a relatively mild mosaic [ibid., xxiii, p. 250; xxvi, p. 107] causing an indistinct mottling of the foliage and a severe type causing yellow or silver-grey stripes on young leaves, often accompanied by partial yellowing and malformation, and brown stripes on older leaves. While some infected varieties remain vigorous and productive others gradually deteriorate. Crops should be inspected regularly, sprayed for aphid control, and infected plants burned.

Leaf scorch caused by *Stagonospora curtisii* [ibid., xxv, p. 330] has only recently been reported from New South Wales. Treatment consists of soaking the bulbs in formalin as for *F. bulbigenum* and spraying the growing crop with Bordeaux mixture at 4–3–40 plus white oil at 1 fl. oz. per gal. at fortnightly intervals if the weather is inclined to be wet.

Ellis (D. E.) & Clayton (C. N.). **Mycosphaerella rosigena on greenhouse Roses.**—*Plant Dis. Reptr*, xxxii, 1, pp. 9–10, 1948. [Mimeographed.]

In September and October, 1947, the commercial varieties of greenhouse roses

Briarcliff and Better Times in Raleigh, North Carolina, were severely affected by a leaf spot causing up to 90 per cent. defoliation of the large plants. The affected leaves showed numerous, irregular, purple-bordered, light brown necrotic spots, 0·5 to 6 mm. in diameter [cf. *R.A.M.*, xvii, p. 753]. Abundant, tiny, black perithecia (some of them containing asci with mature ascospores) occurred on the dorsal and ventral surfaces of both living and dead leaves. Isolates yielded *Mycosphaerella rosigena*, first described from Louisiana in 1887 by Ellis and Everhart. On potato dextrose agar at 25° C. the fungus grew slowly, forming olive-grey colonies with irregular margins. Further studies are in progress.

Magie (R. O.). **Curvularia spot, a new disease of Gladiolus.**—*Plant Dis. Reptr*, xxxii, 1, pp. 11–13, 1948. [Mimeographed.]

Specimens of Picardy *Gladiolus* spikes, received from Fort Pierce, Florida, in August, 1947, showed numerous black spots with spores of a species of *Curvularia* similar to or identical with *C. lunata*. An inspection of the field revealed severe spotting of practically every flower and leaf, with *Curvularia* present on all lesions. Specimens with the same symptoms were received from Alabama, where the disease caused considerable damage during the summer, and from various parts of Florida, where all the main winter production areas were affected by the beginning of November. Corona and Vredenburg were also susceptible.

On the leaves the fungus causes round tan spots surrounded by a reddish-brown ring, outside of which is a yellowish halo. The central part of the spot is covered with black spore masses. The spots may measure 2 in. long and a pattern of concentric rings can often be observed in the browned sunken area. The stem and bud sheaths show brown, oval spots with sunken edges. They enlarge rapidly and turn black with the appearance of spores. The infection penetrates into petals, often preventing the opening of the flowers.

Inoculated Picardy leaves developed leaf spots after 4 to 5 days, sporulation commencing on the sixth day. A 13-hour wetting period induced infection. Inoculation of cut spikes resulted in spotting of the stem after three days, that of petals after two days.

The disease was controlled by spraying the fields at five-day intervals with a mixture of dithane D 14 (2 qts.), zinc sulphate (1 lb.), and hydrated lime ($\frac{1}{2}$ lb.) in 100 gals. water plus a wetting agent. Dithane and puratized agricultural spray ($2\frac{1}{2}$ pints in 100 gals.) were equally effective in preventing infection of the leaves. A two-second dip in a solution of puratized agricultural spray ($1\frac{1}{4}$ pints in 100 gals. plus $1\frac{1}{4}$ pints of ultra wet 30 E) prevented the infection of the spikes.

Hildebrand (E. M.) & Vitopil (W. L.). **Calendula rust and its control with fermate.**—*Plant Dis. Reptr*, xxxii, 1, pp. 13–15, 1948. [Mimeographed.]

Pot marigolds (*Calendula officinalis*) at the A. and M. College, Texas, were severely attacked by a rust disease on 30th October, 1947. Numerous leaf lesions developed suddenly with dark, ring-patterned sori which contained abundant teleutospores. These differed in length from those of *Micropuccinia* [*Puccinia*] *emiliae*, but conformed to *Puccinia flaveriae*. A spray with fermate (2 lb. per 100 gals. water plus PCC, a new spreader, at the rate of 10 fl. ozs.) gave immediate and complete control of the disease.

Weimer (J. L.). **Ceratophorum setosum Kirchn. on Lupines in the United States.**—*Plant Dis. Reptr*, xxxii, 4, p. 133, 1948. [Mimeographed.]

During December, 1947, leaf spots caused by *Ceratophorum setosum* [*R.A.M.*, xix, p. 99; xxvi, p. 143] were found for the first time in the United States on blue lupins (*Lupinus angustifolius*) near Perry, Georgia. In the field the oval to circular

leaf lesions varied from ½ to 4 mm. in diameter, but at the time of the discovery no serious damage was being done.

CASTELLANI (E.). **L'antracnosi del 'Teff'.** ['Teff' anthracnose.]—*Nuovo G. bot. ital.*, N.S., lv, 1, pp. 68–70, 1948.

In this further contribution to a knowledge of the diseases of 'tef' (*Eragrostis tef*) in [former] Italian East Africa [cf. *R.A.M.*, xix, p. 84] the author states that in July, 1947 this host, growing on the eastern slopes of Eritrea, was found to show leaf spotting affecting also the midrib and running along the length of it. The spots were somewhat pointed at the ends and mostly measured 5 to 8 by 1 to 1·5 μ. They were slightly depressed, pale yellow to brown in the centre, and surrounded by a broad, reddish-brown margin. The most severely affected leaves showed yellowing and withering spreading from the apex to the base. The centre of the spots bore numerous, mostly epiphyllous, almost black, punctiform acervuli which measured about 150 to 250 μ in diameter, bearing apical, one-celled, hyaline, falciform conidia, 20 to 36 by 3 to 5 μ. Mixed with the conidiophores were numerous brown, septate setae 80 to 120 μ or more long by 4 to 6 μ, with an almost bulb-shaped basal cell, and slightly pointed and paler at the apex. In view of these characters the fungus is identified as *Colletotrichum graminicola* [ibid., xxv, p. 543; xxvi, p. 494, *et passim*].

Inoculations with a conidial suspension of the fungus made on young potted plants of *E. tef*, oats, wheat, barley, *Setaria italica*, *Phalaris canariensis*, and millet (*Panicum miliaceum*) gave positive results on all these hosts after ten days, leaf spotting being most marked on oats and very slight on *S. italica* and millet.

The injury caused to *E. tef* appeared to be slight, but the disease is probably by no means negligible in very wet areas. Seed disinfection is recommended.

RAYCHAUDHURI (S. P.). **Further studies on Diplodia cajani Raychaudhuri.**—*J. Indian bot. Soc.*, xxvi, 4, pp. 221–225, 1 pl., 1 graph, 1948.

Scattered pycnidia of *Diplodia cajani* [*R.A.M.*, xxii, p. 419] were observed on cankered pigeon peas at Dacca in December, 1941. Five isolates were obtained from Pusa, D_{47}, C, and A being virulent pathogens, D rather weak, and E the weakest. Grown on oatmeal agar at various pH values, it was found that after six days A, C, and E had grown best at pH 7 and D and D_{47} at pH 6·5.

Each isolate grew and sporulated well with a white, slightly aerial mycelium, dark *en masse*, after growing for seven days in liquid media consisting of 100 c.c. water, 1 gm. peptone, and 2 gm. glucose, cane sugar, or starch. C, D, and E also sporulated well in the medium with lactose as sugar and D with cellulose instead of sugar. All culture filtrates were alkaline in reaction except those from cultures of C on the lactose medium and D on the cane sugar, both of which were acid.

CORMACK (M. W.). **Winter crown rot or snow mould of Alfalfa, Clovers, and grasses in Alberta. I. Occurrence, parasitism, and spread of the pathogen.**—*Canad. J. Res.*, Sect. C, xxvi, 1, pp. 71–85, 3 pl., 1948.

This is the full account of the study on crown rot or snow mould of lucerne, clover, and grasses caused by an unidentified Basidiomycete [*R.A.M.*, xxvii, p. 324]. The disease, which occurs in all lucerne-growing districts in Alberta, has not yet been reported outside of Western Canada, but the pathogen has also been isolated from diseased plants originating from British Columbia and Manitoba. The damage caused by the infection varies greatly from year to year. Winter crown rot was most severe in 1943, when 88 per cent. of the stands were infected, the average damage caused being about 20 per cent. Many stands were also destroyed in 1941, 1942, and 1946, the losses being 25 to 50 per cent. During the six-year period the average percentage of stands affected was 62, with an estimated

damage of 10 per cent. Three- to four-year old, fairly dense lucerne stands, in which the pathogen can spread easily from plant to plant, are especially subject to attack. It is rarely found in one-year-old stands, except in heavily infested plots where a diseased crop has been recently ploughed up. The disease occurs under a wide range of soil conditions; it developed on lucerne on new breaking and also after cereals and various other crops.

In addition to the hosts already recorded [loc. cit.] the causal fungus has been isolated from cultivated iris, *Aconitum* sp., phlox, *Thymus serpyllum*, and parsnip, and also from dandelion and *Agropyron repens*.

The characteristic dead patches occur usually on slopes, but are sometimes also found in a level field. Scattered individual plants and small patches are killed first, forming a starting-point for the infection of larger patches. In South Alberta the pathogen causes only partial rotting of the crowns and weakening of lucerne plants. The crowns and less frequently the lower roots of affected lucerne or clover show dark brown distinct lesions. Plants are often killed when only the crown buds and a very small portion of the underlying tissues are affected, but sometimes the whole crown and upper portion of the root may be severely rotted. The pathogen spreads mainly by means of mycelium (no sporulating stage has been found) both above and below ground when the first spring thaw sets in. The distance of radial spread, as measured by killing of the plants, varied in different years from 2·7 to 7·5 in. in thick lucerne stands, and from 0·5 to 6 in. in bare land. Coarse, whitish mycelial remnants of the pathogen are sometimes found in or near the crowns of dead or affected plants.

Isolates of the pathogen on potato dextrose agar at 1° C. require 10 to 14 days to produce observable growth. White stroma-like structures are sometimes produced and colonies about 2 weeks old show numerous clamp connexions fully developed on the septate mycelium.

The crown and root symptoms resulting from inoculation and planting in infested soil were similar to those observed under natural conditions. In field experiments October inoculations showed a higher rate of infection the following spring than those made in late November after freeze-up; no infection resulted from late winter or early spring inoculations.

In all pot experiments plants in dry or moist soil showed considerably more infection than those in wet or saturated soil. Field studies indicated that snow is not essential for the disease development, most severe outbreaks occurring when there was little or no snow cover during November and December.

In other pot experiments complete killing of the plants occurred when the inoculum of the low-temperature basidiomycete was mixed in equal proportions with those of other pathogens frequently isolated from the diseased plants, such as *Cylindrocarpon ehrenbergi*, *Plenodomus meliloti*, *Sclerotinia sativa*, and *Fusarium avenaceum*. *C. ehrenbergi* and *S. sativa* in the presence of the basidiomycete caused more extensive rotting of the roots below the crown than the latter alone.

SPRAGUE (R.). **Some leaf spot fungi on western Gramineae—II.**—*Mycologia*, xl, 2, pp. 177–193, 2 figs., 1948.

Continuing his annotated list of new or little-known fungi causing leaf spots of grasses in the western United States [cf. *R.A.M.*, xxi, p. 203; xxvi, p. 48] the author states that on the basis of present evidence all the collections of *Cercosporella* causing severe leaf scald of various grasses including *Melica subulata* [ibid., xvi, p. 634], *M. bulbosa*, *Deschampsia caespitosa*, and *Festuca rubra*, all belong to one species, *C. subulata*, which the author proposes to transfer to *Spermospora* n. gen., the type species being *S. subulata* n. comb. The distinctive features of the new genus are the subulate or narrow-subulate conidia with the distal cell elongated into a narrow, whip-like tip as opposed to the broadly filiform conidia of *Cercosporella*.

Other specimens include *Ascochyta phleina* n. sp. which appears to be moderately parasitic on *Phleum pratense* and is sometimes associated with *Heterosporium phlei* and *Xanthomonas translucens* var. *phlei-pratensis* [ibid., xxv, p. 389] on living leaves; *Septoria glycericola* n. sp. on living leaves and sheaths of *Glyceria* spp.; *S. passerinii* on *Hystrix patula* previously reported on *Hordeum distichon* and as overwintering on *H. nodosum*; and *S. quinqueseptata* [ibid., xxv, p. 346] as a doubtful parasite of *Koeleria cristata*.

Castellani (E.). **L'antracnosi del Carrubo.** [Carob anthracnose.]—*Riv. Agric. subtrop. trop.*, xlii, 4–6, pp. 81–91, 3 figs., 1948. [English summary.]

Carob (*Ceratonia siliqua*) trees growing near Florence have suffered from a disease somewhat resembling one observed on the same host by the author in Cyrenaica and Palestine. Small, round, discoloured areas, indistinct but clearly visible by transparency, less than one mm. in diameter developed irregularly between the veins of the young leaves, and mostly in the distal third of older leaves. Later, they became deep brown and were readily visible on both leaf surfaces; they rapidly enlarged and became somewhat irregular in shape. Each spot was surrounded by a light green to straw-coloured halo, particularly conspicuous on the upper surface, and shading off gradually into the normal green of the leaf tissues. In some cases the whole distal half of the leaf appeared as a single brown area. The older spots on the lower surface were brown, slightly depressed in the centre, and surrounded at the periphery by a narrow, slightly raised, darker margin. On the upper surface they were nearly black, translucent in the centre and slightly more opaque at the periphery. Leaves of both the current and preceding years were affected. Occasionally, spots measuring up to 5 by 2 mm. were found on the stems; these were light in the centre and were surrounded by a narrow brown margin. The young leaves above such spots turned yellow and fell prematurely, though not themselves infected.

The leaf spots bore (almost always on the upper surface) scattered or concentrically arranged black acervuli which were abundantly present in wet periods and rare in dry. The fungus is identified as *Colletotrichum gloeosporioides*. It was also noted that at the end of summer many spots indistinguishable from those described above contained *Cercospora ceratoniae* [*R.A.M.*, xvii, p. 533].

Colletotrichum gloeosporioides was isolated in pure culture, and showed scanty growth below 10° or over 35° C., optimum growth between 25° and 30°, and none at 40°.

Inoculation experiments were carried out in winter on small leaves of the previous year using a conidial suspension in water plus agarized Czapek's liquid after which the leaves were steeped in a 10 per cent. saccharose solution, both surfaces being wetted. The fungus was unable, apparently, to penetrate the upper leaf surface, but inoculation of the lower surface resulted in spots developing in two days, rapidly enlarging and forming extensive necrotic areas. Infection spread to the upper surface of the leaves in about ten days, and the fungus was re-isolated from the affected material.

Further studies are in progress.

Castellani (E.). **Il mosaico del Fico.** [Fig mosaic.]—Reprinted from *Riv. Soc. Tosc. Ortic., 1947*, 5 pp., 2 figs., 1948.

During the past two years figs growing in the vicinity of Florence and elsewhere in Italy have shown symptoms agreeing perfectly with those of fig mosaic as described by Condit and Horne from California [*R.A.M.*, xiii, p. 252; xxiv, p. 66]. One severely affected tree (5 years old) had been obtained from a shoot from a mother tree, which, the grower stated, had shown the same symptoms. All the varieties generally grown in the vicinity of Florence appeared to be susceptible

particularly Verdino, followed in descending order of susceptibility by Dottato, Brogiotto, and San Piero. The disease was also observed, presenting the same symptoms, on wild fig [*Ficus carica* var. *sylvestris*].

Hilborn (M. T.), Lathrop (F. H.), McDonald (F. J.), Crocker (C.), & Tripp (D.). **Two homemade spray booms for Maine Apple orchards.**—*Bull. Me agric. Exp. Sta.* 458, pp. 355–369, 2 figs., 3 diags., 1948.

The advantages of thorough coverage and saving of time, labour, and spraying materials to be obtained from the use of spray booms are countered by the facts that (1) an extra man besides the driver is required to adjust the angle of the spray boom unless it is entirely automatic or mounted on the front of the tractor where it can be operated by the driver, (2) the rough surface of the ground in most New England orchards limits the speed at which the machines can be driven in order to operate efficiently, and (3) some of the newer spray booms still use more spray material than necessary for disease control. During 1946 and 1947 attempts were made at Highmoor Farm to develop an economical spray boom adapted to Maine orchards and which being mounted on the front of the tractor could be operated by the driver alone and having fixed nozzles on an almost vertical adjustable boom would give good coverage to the most inaccessible parts of the tree using a minimum of spray material. In experimental tests the Highmoor Multiple nozzle and Sectional Spray Booms saved 45 per cent. spraying time, 30 per cent. in the volume of spray used, and 73 per cent. man-hours of labour. The design of these booms, which are easily made and are fully described and figured, can be changed to meet individual requirements.

Louw (A. J.). **Fusicladium of Apples. V. Control by spraying.**—*Fmg S. Afr.*, xxiii, 263, pp. 122–129, 10 figs., 1948.

From further studies on the control of *Fusicladium* disease [scab] of apples [*Venturia inaequalis*: cf. *R.A.M.*, xxvii, p. 326] it appears that the choice of a spray programme depends on the apple variety, the geographical situation, and the spraying programme applied for the control of the codling moth [*Cydia pomonella*]. Where lead arsenate is still used for this purpose either Bordeaux or lime-sulphur may be used to control *V. inaequalis*, depending on which produces the least scorching. When oil sprays or nicotine are to be used against the codling moth, copper oxychloride (5 lb. per 100 gals. water) or a neutral wettable sulphur at the same rate should be applied as the fungicide, respectively.

Darpoux (H.). **Les tavelures du Poirier et du Pommier.** [Pear and Apple scab.]—*Jardins de France*, Sér. VII, i, 8, pp. 215–226; 9, pp. 241–250, 6 figs., 2 diags., 2 graphs, 1947.

In this paper the author discusses the biology of apple and pear scab (*Venturia inaequalis* and *V. pirina*), and their control, including spray warning services in France [*R.A.M.*, xxv, p. 399], eradicant sprays (1 per cent. caustic soda immediately destroyed all perithecia), the timing of sprays, and some of the new fungicides developed in the United States.

Dunegan (J. C.), Goldsworthy (M. C.), & Wilson (R. A.). **Ferric dimethyl dithiocarbamate—a satisfactory material for the control of the Apple blotch fungus.**—*Plant Dis. Reptr*, xxxii, 4, pp. 135–136, 1948. [Mimeographed.]

In Delaware in 1947, fifty-four Duchess (Oldenburg) apple trees showing twig lesions caused by *Phyllosticta solitaria* were sprayed once in May and twice in June with five test compounds. The fruit was harvested on 7th July and the number of blotch-infected apples determined for each treatment. Trees sprayed with Bordeaux mixture at 4–4–100 and copper 8-quinolinolate at 1–100 [*R.A.M.*, xxvi,

p. 67] developed 4·5 and 7·8 per cent. blotch, respectively, and the untreated 34·0 per cent., while those treated with ferric dimethyl dithiocarbamate at 2–100 (sold under the names of fermate and karbam black [ibid., xxvi, p. 347]) developed only 3·0 per cent. blotch and produced neither russeting of the fruit nor scorching of the leaves. As the results of this experiment agree with those already obtained by the same author in Arkansas [ibid., xxii, p. 488; xxiii, p. 393] it is concluded that Bordeaux mixture can be replaced by ferric dimethyl dithiocarbamate to control *P. solitaria*. The dark residue left on light-coloured fruit can safely be removed by brushing.

Meier-Jecklin (K.). **Untersuchungen über ein nicht parasitäres Zurück- und Absterben von Obstbäumen im Kanton Graubünden. Ursachen und Mittel zur Abhilfe.** [Investigations into a non-parasitic dying-back and dying of fruit trees in the canton Grisons. Causes and control measures.]—*Annu. agric. Suisse*, xlix, 3, pp. 193–272, 36 figs., 1 diag., 3 graphs, 1948. [French summary.]

During the last few years, apple and pear trees in certain orchards in the canton of Grisons in the Rhine valley were observed to bear shoots with leaves only at the tip and base. The bark was sometimes swollen and little growth was observed from the buds. The leaves of the apical rosettes were small and lanceolate and often the cambium became brown and functionless. In most cases the crop was very poor, the fruit being dented, deformed, and the variety finally unrecognizable. The surface of the fruits bore corky spots or bands with suberous areas in the flesh beneath. The shoots were the first to die, followed by the limbs and finally the whole tree [*R.A.M.*, xxvi, p. 305]. Grafting failed to save the trees. The results of field experiments with grown trees at Felsberg and experiments with potted plants in Realta soil at Wädenswil and with grown trees in a Realta orchard showed that the disorder was due to an almost complete absence of phosphoric acid and a deficiency of potash, boron, and nitrogen [ibid., xxvii, p. 74]. The condition was aggravated by very low temperatures, excessive variation in temperature, excessive sunlight, and lack of water. The disorder was corrected in the seriously affected potted plants by the application of mineral and soluble fertilizers containing the deficient elements and as a result the trees bore normal, healthy fruit. Satisfactory results were also obtained in the field at Felsberg and Realta by appropriate application of fertilizers together with the use of judicious irrigation. Additional preventive and curative measures consist of the application of magnesium in the manure when necessary, good soil management, the application of humus, and the maintenance of well-manured soil.

Wade (G. C.). **Orchard hygiene in winter for the control of plant diseases.**—*Tasm. J. Agric.*, xix, 2, pp. 92–95, 2 figs., 1948.

Methods of destroying the overwintering states of a number of important diseases of orchard crops in Tasmania are described, including canker of apples and pears caused by *Physalospora cydoniae* [*P. obtusa*: *R.A.M.*, xi, p. 114] which is quite common in some parts of Tasmania, particularly the north.

Perotti (R.). **Su la 'moria' dei fruttiferi in Alto Adige.** [On fruit-tree decline in the Upper Adige.]—*Ann. Fac. agr. Pisa*, N.S., viii, pp. 199–208, 1947.

During the last ten years, certain pear varieties growing throughout the upper valley of the Adige and the vicinity have shown a serious decline, the trees dying off in not more than three years. The condition has recently become worse. After reviewing the available data the author concludes that the condition is due to defective nutrition resulting from lack of histo-physiological compatibility between the stock and the graft, in association with fluctuations in the local soil and atmo-

spheric moisture and temperature conditions. Further investigations are to be made.

Darpoux (H.) & Vuittenez (A.). **Essais de traitements en cours de végétation contre la tavelure du Poirier.** [Experimental spray treatments during vegetation against Pear scab.]—*C. R. Acad. Agric. Fr.*, xxxiv, 2, pp. 126–131, 1948.

Full details are given of spraying trials against pear scab (*Venturia pirina*) [*R.A.M.*, xxvi, pp. 347, 533] carried out at Jagny and Versailles.

Of the materials tested the copper products alone remained effective long enough to give a clean crop. Bordeaux mixture (1 per cent.) gave the most consistent results. Copper oxychloride (0·5 per cent. of a product containing 50 per cent. copper or 1·5 per cent. of a 16 per cent. copper product for the first two sprays) was rather less effective at first, especially when the mixture containing 16 per cent. copper was used. Micronized sulphur (1 per cent.) was about as effective as lime-sulphur. The compound 2-heptadecylglyoxalidine gave unsatisfactory results, but deserves further trial if its stability or adhesiveness can be improved. Neutral orthoxyquinoline sulphate (1 per cent. mixture of a product containing 2·75 per cent. active material) was active when applied the day before the contaminations, but its effectiveness did not persist long. It merits further test provided it can be rendered more stable and its adhesiveness increased.

Darpoux (H.) & Vuittenez (A.). **Essais de traitements complémentaires contre la tavelure du Poirier.** [Supplementary experimental treatments in the control of Pear scab.]—Reprinted from *C. R. Acad. Agric. Fr.*, xxxiv, 5, pp. 247–249, 1948.

Further experiments on the control of pear scab [*Venturia pirina*: see preceding abstract] were aimed at reducing the primary causes of infection as far as possible. In laboratory experiments ascospore discharge was completely checked by soaking leaf fragments bearing perithecia for one minute in a 2·5 per cent. soda solution or in 10 per cent. potash or sulphuric acid, or for three minutes in a 2·5 per cent. solution of the two latter. In practice sulphuric acid solutions at 2·5 or 5 per cent. should be effective. On the other hand, ascospore discharge appeared to be stimulated by 15 per cent. solutions of ammonium sulphate, sodium phosphate, sodium chloride, and potassium chloride. The action of 2–4 potassium dichlorophenoxy-acetate had a marked stimulatory effect on ascospore discharge and germination. Twenty-four hours after treatment the average length of the germ-tubes in the ascospores examined was 500, 400, and 200 μ for those treated with a 1 in 1,000 and 1 in 100,000 solutions and for the controls, respectively. The results of these experiments, however, must be confirmed by further investigations before the practical use of these products can be recommended. When no rain is imminent, the application of these stimulatory products followed by a thorough soil irrigation would probably empty all the perithecia in less than a week, while in cases where rain is imminent one treatment should suffice to prevent any primary infection.

Stoddard (E. M.). **The X-disease of Peach and its chemotherapy.**—*Bull. Conn. agric. Exp. Sta.* 506, pp. 3–19, 1947.

The X-disease or yellow-red virosis [*R.A.M.*, xix, p. 292; xxvi, p. 112] has become a major threat to peach production in the north-eastern United States and a similar, probably identical disease occurs on peaches and chokecherry (*Prunus virginiana*) throughout the northern half of the country.

In the north-eastern United States the virus spreads in nature from chokecherry to peach [ibid., xxi, p. 147; xxii, p. 256] but no evidence has been obtained that it can be naturally transmitted from peach to chokecherry. The disease can be readily transmitted by budding [ibid., xx, p. 540; xxi, p. 259] or grafting from

peach to peach and from chokecherry to purple-leaf peach, while the transmission from chokecherry to green-leaf peach or from green-leaf peach to chokecherry is more difficult. So far all attempts to determine an insect vector have failed.

The virus was inactivated at 53° C. and diseased buds, treated in water at this temperature, suffered no injury. Inactivation of the virus in many diseased buds was effected by immersion in various chemicals for an hour followed by rinsing in water. Quinhydrone, 8-hydroxyquinoline sulphate, hydroquinone, paranitrophenol, and calcium 8-hydroxyquinolate gave the best results, reducing the percentage transmission from 96 to 20, 40, 50, and 50, respectively. The action of 8-hydroxyquinoline sulphate was unique in that it was only temporary.

Using seedlings in pots, injection of chemicals through the cut end of the top of the main stem was found to give an even and complete distribution throughout the plant. Such a method proved useful for testing new materials, but the application of solutions to the soil resulted in their being taken up by the roots with no apparent loss of effectiveness.

The results of greenhouse experiments using all methods of application showed that peach trees can be immunized against artificial inoculations of X-disease by injection of or watering with aqueous solutions of various chemicals, most of which give better control when applied after inoculation. Trees treated with sodium sulphadiazine, sodium sulphamerazine, sulphaguanidine, zinc sulphate, hydroquinone, and disodium ethylene bisdithiocarbamate showed considerable immunity 10 months after application. The results of treatments with extracts of *Prunus serotina*, which is immune from X-disease, suggest that there is an extractable fraction capable of inactivating the virus. In treatment with calcium chloride, increasing the concentration from 0·1 to 0·2 per cent. increased control from 25 to 100 per cent.

Further field trials are in progress.

Dunegan (J. C.) & Goldsworthy (M. C.). **The control of blossom blight and its relation to brown rot of Red Bird Peaches at harvest.**—*Plant Dis. Reptr*, xxxii, 4, pp. 136–137, 1948. [Mimeographed.]

During the spring of 1947, Red Bird peach trees in Delaware were sprayed four times in April during the blooming period with various materials, four times during May and June with wettable sulphur, and dusted once with sulphur on 2nd July before harvest with the object of determining whether the control of blossom blight affects the incidence of fruit brown rot (*Monilinia* [*Sclerotinia*] *fructicola*) [*R.A.M.*, xxvii, p. 139] at harvest time. At the end of the blooming period counts were made of the number of blighted blossoms on random trees from every plot. The results showed that trees sprayed with 2,3 dichloro-1,4 naphthoquinone (¾–100) [ibid., xxiii, p. 265] developed only 2·0 per cent. blossom blight and had less rotted fruit (11·8) at harvest than did any of the trees sprayed with the other compounds, whilst the controls had 32·9 per cent. and 46·6 per cent., respectively. In all cases the results indicated that where there is a reduction in the number of blighted blossoms there is a corresponding drop in the number of infected fruits at harvest time.

Darrow (G. M.). **Resistance of Blackberries to cane rust at Beltsville, Maryland, 1947.**—*Plant Dis. Reptr*, xxxii, 1, pp. 5–6, 1948. [Mimeographed.]

In resistance tests conducted at Beltsville, Maryland, in October, 1947, the following varieties or selections of blackberry [*Rubus* spp.] were entirely free from stem rust (*Kuehneola uredinis*) [*R.A.M.*, xxvii, p. 144]: Austin Thornless, Boysen, Brainerd, Burbank Thornless, Cameron, Cory (Bowenberry), Merton Early, Merton Thornless, Nanticoke, Nessberry (blackberry × raspberry), Oregon Evergreen, *Rubus* species 131870, 2 *Rubus pubescens*, 1 *Rubus innominatus*, Texas 40–51 = Bigness, Texas 40–78, Texas 40–181, and Texas 40–202 = Regalness. The evidence

indicated that the available European blackberries were highly resistant, that the western trailing blackberry carried resistance, and that the New York blackberry selections ranged from highly resistant to highly susceptible.

Merny (G.). **La maladie de Panama des Bananiers.** [Panama disease of Bananas.]—*Fruits d'Outre Mer*, iii, 6, pp. 211–215, 7 figs., 1948.

The author briefly summarizes the available information on the method by which the banana Panama disease organism (*Fusarium oxysporum* var. *cubense*) [*R.A.M.*, xxvii, pp. 76, 77] invades the root and rhizomes, the ecology of the infection with regard to soil humidity, acidity, and ventilation, and the methods of control by quarantine, soil disinfection, use of resistant varieties, and soil amelioration.

Magee (C. J.). **Woodiness or mosaic disease of Passion fruit.**—*Agric. Gaz. N.S.W.*, lix, 4, pp. 199–202, 208, 5 figs., 1948.

Woodiness or mosaic disease [*R.A.M.*, xxiv, p. 237] caused by cucumber virus 1 [cucumber mosaic virus] continues to be a major threat to passion fruit [*Passiflora edulis*] crops in New South Wales. The symptoms [ibid., viii, p. 115; xviii, pp. 748–749] and the severity of the disease are influenced mainly by seasonal conditions (low temperatures of 50° to 60° F. are especially favourable) but also by age and vigour of the vines and soil fertility. Vines six to nine months old usually suffer less and make a better recovery than those of 18 to 21 months.

In addition to vectors already noticed [loc. cit.] *Aphis gossypii* also transmits the virus, which affects many common weeds and other hosts. Although there is no experimental evidence that the virus is seed-transmitted, the very early appearance of symptoms in the seed bed suggests that it probably is.

As no preventive measures exist at present, the control is directed at minimizing the effects of the disease by providing favourable growth conditions. Warm, sheltered sites should be selected with well-drained, virgin soils and their fertility maintained by green cropping, crop rotation, and erosion control. The vines should be transplanted early in the summer and maximum growth should be fostered before the onset of the winter. The life of a plantation should be limited to three to four years. Some growers have found it most profitable to plant a new block every year. Relatively heavy dressings of fertilizers should be given in the spring and summer. Pruning back should be delayed until warm spring weather. Field selections of strains showing some tolerance to the virus are being investigated.

Patel (M. K.), Moniz (L.), & Kulkarni (Y. S.). **A new bacterial disease of Mangifera indica L.**—*Curr. Sci.*, xvii, 6, pp. 189–190, 1948.

In 1947 a bacterial disease of mango was observed at the Agricultural College Farm, Poona, and at Dharwar, India.

The affected leaves showed small, angular, water-soaked areas, measuring 1 to 4 mm. in diameter, light yellow first, later turning deep brown, the necrotic, often rough and raised spots being surrounded by a distinct halo. Most of the spotting occurred at the tips of the leaves; marginal infection resulted in deformities and cracking. The petioles, fruits, and tender stems can also be infected.

The pathogen differs slightly from that described by Doidge from South Africa (*Ann. Appl. Biol.*, ii, 1, 1915) and is named *Pseudomonas mangiferae-indicae* n. sp. It has short rods, single or in chains of two to four, 0·45 to 1·44 by 0·36 to 0·54 μ, is motile, Gram-negative, non-capsulated with no endospore. After seven days on potato dextrose agar it forms white to creamy-white, circular, smooth, glistening, pulvinate colonies with entire margin, measuring 1 to 1·5 cm. in diameter, with no distinctive odour. The organism liquefies gelatine, digests casein, attacks starch, produces acid but no gas in dextrose, sucrose, lactose, and mannitol, grows fairly

well in Uschinsky's solution but not at all in Cohn's, and produces no nitrate, indole, or ammonia. The M.R. and V.P. test was negative. The optimum temperature for growth is 27° C. and the thermal death-point about 55°.

McDonald (J. E.) & Fudge (J. F.). **Commercial insecticides and fungicides in Texas 1946–1947.**—*Circ. agric. Coll. Tex.* 118, 11 pp., 1947.

This is the fifth annual report [cf. *R.A.M.*, xxvi, p. 346] setting forth the analyses of insecticides and fungicides made under the Texas Insecticide and Fungicide Law during the year.

Flanzy (M.). **Appréciation de la densité des soufres. Étude de la méthode Chancel.** [Measuring the density of sulphurs. A study of the Chancel method.]—*Rev. Vitic., Paris*, xciv, 6, pp. 173–176, 1948.

The author describes the Chancel method (originally described in *Bull. Soc. centr. agr. Hérault*, xliv, p. 151, 1857) for estimating the relative density of sulphur. The method was applied to a series of manufactured sulphurs in 1944–45 and the results are given in detail. From these it is concluded that the Chancel method does provide a means of distinguishing between different forms of sulphur according to their relative density. The best-quality sulphur is that with the highest Chancel degree. The method is improved by using an aqueous alcoholic solution (40 centesimals at 15° C.) instead of ordinary ether.

Vágó (I.). **Färbungsverfahren zur Zählung von Hyphomycetessporen.** [A staining method for counting Hyphomycete spores.]—*Mikroskopie, Wien*, ii, 3–4, pp. 114–117, 1 fig., 1947.

The following procedure has proved effective when counting spores of Hyphomycetes, e.g., *Penicillium glaucum*. After fixing over a flame, a two-minute dip in alkaline methylene blue while heating is followed by rinsing and five minutes in a concentrated aqueous solution of the disodium salt of dibromo-oxy-mercurifluorescein, known commercially as mercurochrome [*R.A.M.*, xi, p. 758]. The spores stain dark blue and stand out sharply against the uniform light red of the rest of the preparation.

Marchionatto (J. B.). **El fenómeno de la restitución en la defensa de la planta.** [The phenomenon of restitution in plant defence.]—*Ciencia Invest.*, iii, pp. 501–503, 1947. [Abs. in *Herb. Abstr.*, xviii, 2, p. 85, 1948.]

The author suggests adding the phenomenon of restitution, by which the plant is able to regenerate the organs lost through disease and produce a new individual, to the list of defensive reactions in plants suggested by Gäumann [*R.A.M.*, xxvi, p. 22]. Although the new organs may not differ in degree of resistance to the pathogen from those destroyed, they can elude the action of parasites and so contribute to the defence of the plant and the conservation of its life.

Verona (O.). **Sulla durata della vitalità in alcune specie di funghi.** [On the duration of viability in some species of fungi.]—*Nuovo G. bot. ital.*, N.S., liii, 1–2, pp. 323–325, 1946. [Received August, 1948.]

When fungous cultures on agar that had been left untouched during the war at the Institute of Plant Pathology, Pisa, were subcultured it was found that *Mucor racemosus* and *M. spinosus* were still viable after more than five years. *Chaetomium bostrichodes*, *C. globosum*, *C. indicum*, and two other *C.* spp. grew after four and a half years, but not *Ceratostomella paradoxa*. *Sporotrichum beurmanni* [*S. schencki*] had remained viable for three years, and the conidia of *Stemphylium botryosum* germinated after 12½ years when cultured on pieces of carrot.

Bartz (Q. R.). **Isolation and characterization of chloromycetin.**—*J. biol. Chem.*, clxxii, 2, pp. 445–450, 1 fig., 1948.

A full account is given of the methods of isolation and characteristic properties of the new crystalline antibiotic chloromycetin from a soil-inhabiting *Streptomyces* [*R.A.M.*, xxvii, p. 146].

Krishnaswamy (M. A.) & Laxminarayana (H.). **Microflora in butter.**—*Curr. Sci.*, xvii, 5, p. 159, 1948.

Studying the microbiological deterioration of market butter, the authors observed striking differences in the microflora of 'desi' (prepared from boiled, soured milk), and creamery butter (pasteurized cream), mainly due to the acidity of the former, which inhibited bacterial growth, but favoured the development of contaminating yeasts and moulds [*R.A.M.*, xxi, p. 79; xxiv, p. 241; xxvii, p. 250]. This study confirms previous findings that fungi play a major part in the deterioration of 'desi' as most of the bacterial population had little effect on its spoilage.

Mildew proofing agent.—*Paint Manuf.*, xviii, 8, p. 298, 1948.

A fungicidal dressing for the treatment of leather goods against mildew [unspecified: *R.A.M.*, xxvii, p. 251], developed by the U.S. National Bureau of Standards is stated to contain 20 per cent. of a mixture of equal parts of neat's foot oil and mineral oil, 2 per cent. of paranitrophenol, 10 per cent. of cyclohexanone, and 68 per cent. of perchloro-ethylene or Stoddard's solvent, preferably the former, which is non-inflammable. The mixture should be applied so that the amount of paranitrophenol (the active ingredient) is not more than 0·35 per cent. the weight of the treated leather. It should not be used for articles that come into close contact with the skin.

Gäumann (E.) & Böhni (Erika). **Über adaptive Enzyme bei parasitischen Pilzen II.** [On adaptive enzymes in parasitic fungi II.]—*Helv. chim. Acta*, xxx, 6, pp. 1591–1595, 2 graphs, 1947.

The results of the authors' further studies [cf. *R.A.M.*, xxvi, p. 313] showed that *Aspergillus niger* produces pectase, as an adaptive enzyme, only in the presence of pectin. A pectin-free glucose nutrient solution does not therefore contain any pectase, which fact may be important for industrial purposes. On the other hand, the specific pectinase is a constitutive enzyme, produced in about the same quantities whether or not pectin is present.

Dominik (T.) & Truszkowska (Mme W.). **Przyczynek do znajomości mykorhizy u niektórych Paproci.** [A contribution to the study of mycorrhiza in some Ferns.]—*Acta Soc. bot. Polon.*, xviii, 1, pp. 45–63, 7 figs., 1947. [French summary.]

In their investigations of root systems of various ferns [cf. *R.A.M.*, xviii, p. 469], the authors found that *Ophioglossum vulgatum*, *Botrychium lunaria*, *Osmunda regalis*, *Pteridium aquilinum*, *Scolopendrium vulgare typicum* [*Phyllitis scolopendrium*] and its f. *crispum*, and *Struthiopteris germanica* formed endotrophic mycorrhiza, *Aspidium* [*Dryopteris*] *filix-mas* endotrophic and ectotrophic, while *Blechnum spicant* showed no symbiosis, probably because the material was taken from a cultivated park where the soil was pH 7. These results are contrary to Stahl's findings (Der Sinn der Mykorrhizenbildung (Filicinen)—*Jahrb. wiss. Bot.*, xxxiv, p. 568, 1900) that most ferns do not form mycorrhiza but are in accordance with those of Butler [*R.A.M.*, xviii, p. 469] and Asai [ibid., xiii, p. 717].

Bawden (F. C.) & Crook (E. M.). **Some properties of Potato virus X in leaf extracts made in different ways.** *Brit. J. exp. Path*, xxviii, 6, pp. 403–415, 1 pl., 1947.

By incubating fibrous residues from leaves of Kondine Red tomato, White Burley tobacco, *Nicotiana glutinosa*, and Majestic and Doon Star potato, all infected with potato virus X, with enzymes from the alimentary tract of snails (*Helix aspera*), as much virus is obtained as occurs in sap. Some 4 per cent. of the virus thus extracted is released by grinding the fibre finely in a triple-roller mill.

There was little difference in infectivity between the virus in the several kinds of extracts, but particle size varied widely. In mill extracts, for instance, the particles are short, seldom exceeding 250 μ in length, and give somatic-type precipitin reactions [cf. *R.A.M.*, xxvi, p. 174], whereas in snail extracts they are greatly elongated; in freshly extracted sap particle length is variable, but the average is greater than in mill extracts and a length of over 5,000 m μ may be attained. Both snail extracts and freshly extracted sap give flagellar-type reactions. The incubation of mill extracts with healthy plant sap or trypsin causes aggregation of the small particles and changes their precipitin reaction from somatic to flagellar type.

Potato virus X in mill extracts or in purified preparations, but not in sap, is inactivated by incubation with pH 7 phosphate buffer and chloroform. This inactivation may be prevented by snail enzyme preparations, healthy leaf sap, and some other protein-containing solutions, e.g., albumin, gelatin, and casein. An interesting result was obtained with a concentrated preparation of tobacco leaf protease of the papain type. At pH 7 the presence of this enzyme protected the virus against inactivation by the phosphate buffer, whereas at pH 5·5, where the latter does not inactivate, the protease itself destroyed the virus.

The virus content of infected plants varies with different hosts and virus strains, reaching a maximum of 2 per cent. of the dry weight of the leaves with X^K in tomatoes. No unequivocal evidence is forthcoming either as to the size of the particles as they occur in the host cells or the relationship between the virus present in the sap and that remaining in the fibrous residues.

Felton (M. W.). **The development of stem end discoloration in Bliss Triumph Potatoes held in warm storage.**—Abs. in *Amer. Potato J.*, xxv, 2, pp. 49–50, 1948.

In 1945 Nebraska samples of dry-land potato tubers were taken from cold cellar storage and stored at 45° and 75° F., respectively. Eight weeks later the lots averaged, respectively, 3·5 and 24 per cent. severe stem-end vascular discoloration (a symptom of attack by *Fusarium* sp. [*R.A.M.*, xxii, p. 220]). In 1946 similar samples held in cold storage until March and carrying 0·8 per cent. discoloration were stored at various temperatures. After seven weeks the discoloration was still about the same at 40°, but had increased to 2 per cent. at 50°, 12 at 60°, and to 22 at 70°, thus indicating that stem-end discoloration may be substantially increased in warm storage.

Bernaux (P.) & Barry (J. P.). **Une maladie de la Pomme de terre nouvelle pour la France (Sclerotium bataticola Taub.).** [A Potato disease new to France (*Sclerotium bataticola* Taub.).]—*Progr. agric. vitic.*, cxxix, 5–6, pp. 84–86, 1 fig., 1948.

Potato charcoal rot (*Sclerotium bataticola*) [*Macrophomina phaseoli*: *R.A.M.*, xxiii, p. 187; xxiv, p. 202; xxv, pp. 255, 330] was observed near Marseilles in 1946 and at Pérols (Herault) in 1947. Examination of affected Bintje tubers showed that infection may occur on the side of the stolon or may be general over the whole surface. In the former case, an extensive black area up to 10 mm. deep may develop, separated from the healthy tissue by a cork layer. In the latter case (charcoal rot

properly so called) black areas 2 to 3 mm. in diameter are localized round the lenticels under the skin. On peeling the tuber, the black spot can readily be seen, the lenticel being visible on it. Secondary organisms, mostly bacteria, may effect penetration at this point and cause tuber rot. The disease may cause a 50 per cent. reduction in crop.

The control measures recommended are rotation, the use of early varieties (infection being favoured by high temperature), avoidance of injury to healthy tubers, storage at temperatures not over 3° or 4° C., and the use of healthy tubers for seed.

Racicot (H. N.). **A sound policy for the control of bacterial ring rot in Canada.**—*Contr. Bot. Plant Path., Dep. Agric., Can.*, 806, 8 pp., 1945. [Received June, 1948.]

In this address delivered in Toronto in 1945 the author expresses the view that the only adequate control of potato ring rot (*Corynebacterium sepedonicum*) [*R.A.M.*, xxvii, p. 293] in Canada lies in its complete eradication from individual farms. This entails (1) the proper disposal of all potatoes, infected or clean, on the farm where the disease has been found, (2) the cleansing and disinfection of store-places, machinery, tools, bags, etc., and (3) the planting of clean seed potatoes the following season. The first step necessary is the adoption of adequate legislation, Federal and Provincial [cf. ibid., xxiv, p. 492; xxv, pp. 61, 317; xxvi, p. 441]. Every province should have a plant-disease act under which regulations for the control of ring rot could be made. Such regulations should make it compulsory to carry out the control practices cited above and should also include authorization to enable the local Department of Agriculture to establish ring-rot-free areas into which no potatoes for planting, except fully certified seed potatoes, could be brought without a permit; such potatoes would be grown under supervision for one year. In areas where certified seed is grown only 'Foundation' and 'Foundation A' should be permitted. These areas would be surveyed each year for ring rot until they became free from it, after which they should be given slight supervision by the Department of Agriculture and the disease made notifiable. The movement of infected potatoes after 31st January should be prohibited, directions being issued for their suitable disposal. This would provide the necessary authority to deal with infected potatoes imported from outside the provinces. In addition all used potato-bags sold by dealers anywhere in Canada should be disinfected. Detailed recommendations are laid down for the various provinces separately, and the paper concludes with some general considerations.

Baribeau (B.). **Bacterial ring rot of Potatoes.**—*Amer. Potato J.*, xxv, 3, pp. 71–82, 2 figs., 1948.

This study surveys the present state of knowledge of bacterial ring rot of potatoes (*Corynebacterium sepedonicum*) first reported in Canada in 1931, and since then from all the Canadian provinces [*R.A.M.*, xxvi, pp. 8, 188] and 45 States of the United States [ibid., xvi, p. 404; xviii, p. 52; xxvii, p. 332]. It has been reported from France by Lanslade (*J. Pomme de terre franç.* 41, 1942; *C. R. Acad. Agric. Fr.*, 1943) where it is said to affect 20 to 30 per cent. of the plants in the most severely affected fields.

The disease represents a potential threat to all potato-growing countries throughout North America and Europe. The yield reductions are caused by rotting of the tubers in the field (one potato to 75 per cent. infection) and in storage [ibid., xxvi, p. 353]. In France the disease is transmitted by the mother tuber but such a progeny disappears in two or three years.

Teton [ibid., xxvii, p. 332] was found to be highly resistant and the French variety Furore has never shown any trace of infection.

Black (L. M.), Mosley (V. M.), & Wyckoff (R. W. G.). **Electron microscopy of Potato yellow-dwarf virus.**—Reprinted from *Biochim. biophys. Acta*, ii, pp. 121–123, 1 fig., 1948.

Electron micrographs of an ultracentrifugally fractionated suspension from the juice of *Nicotiana rustica* leaves infected with the potato yellow dwarf virus [*R.A.M.*, xxvi, p. 313] showed short, rod-like objects about 0·2 by 0·05 μ, that have not been found in similarly treated juice from healthy plants. Leaves of *N. rustica* infected with the milder New Jersey strain of potato yellow dwarf virus also yielded the rod-shaped bodies but in greatly reduced numbers. It is suggested that the bodies may be the elementary virus particles.

Van Der Plank (J. E.). **The relation between the size of plant and the spread of systemic diseases. II. The aphis-borne Potato virus diseases.**—*Ann. appl. Biol.*, xxxv, 1, pp. 45–52, 1948.

The second paper in this series [*R.A.M.*, xxvii, p. 218] deals with field reactions of large and small potato plants to virus infection transmitted by aphids, especially *Myzus persicae*. Counts showed that *M. persicae* spreads almost uniformly over the foliage and therefore occurs more abundantly on larger plants which are thus more exposed to the one effective virus transmission, which with a systemic disease is all that is needed for complete infection of the plant. The greater vulnerability of larger plants to leaf roll confirms this [ibid., vi, p. 573] but is better explained by the systemic nature of the disease (the rate of current-season infection of which varies with the size of haulm receiving it) rather than by its transmission by aphids. Evidence indicates that short days reduce the growth of the haulm, but without reducing yield, and thus reduce current-season infection by aphis-borne diseases. This fact is apparently responsible for the absence of degeneration of short-day potato varieties in various parts of South Africa when crops are grown during short days (spring and autumn) whereas degeneration is rapid where only one (summer) crop is grown. It is suggested that the European and North American potato virus problem is to a great extent the result of growth in long days and of farming practice which produces luxuriant haulms.

Low temperatures also reduce the size of haulm. Therefore earlier planting, even by one week, which would give a lower average temperature over the first two months, should be of some value in reducing current-season infection [cf. ibid., xxvi, p. 209]. Small plants grown on poor soils usually possess some resistance to virus infection, which, however, dwindles when the fertility is increased [ibid., viii, p. 665]. Fertilizer mixtures should be altered, especially in nitrogen content, so as to give adequate yields with the minimum of haulm. In England, generally, the smaller early varieties are less vulnerable to systemic infection than the late.

Van Der Plank (J. E.). **Origin of some plant viruses.**—*Nature, Lond.*, clxii, 4112, pp. 291–292, 1948.

As all King Edward potatoes are affected with paracrinkle virus [*R.A.M.*, xix, p. 604; xxiii, p. 472], and it is absent from all other varieties, the author concludes that the virus has no natural means of spreading and must have been present in the original King Edward seedling. It must have arisen therefore in a phase not shared by plants propagated vegetatively, that is, in the germinating seed or very young seedling. Evidence indicates that other viruses may also have originated in germinating seed. It appears possible that viruses arising during germination, when food reserves are being broken down, would be destroyed during the reverse biochemical processes in seed formation. Viruses that penetrate the seed do appear to be universally, although sometimes incompletely, destroyed by the biochemical processes involved. The suggestion that viruses have arisen from occasional syntheses during germination is the simplest explanation of this destruction.

Even in plants propagated vegetatively one can usually trace a connexion with propagation by seed. Stone fruits, for example, are usually budded on seedling stocks; the raising of new potato varieties is from seed. It is significant that since 1937 the number of virus diseases first recorded on plants grown from seed or on seedling stocks (31) is significantly greater than the number on plants propagated only by vegetative means (5).

It is suggested that the synthesis in healthy tissue of enough virus to effect further multiplication is a rare event which occurs in the protein-rich seed during the intensive chemical activity of germination, one successful synthesis followed by successful dispersal being all that is really needed for each virus.

Goidànich (G.) & Mezzetti (A.). **La Spongospora subterranea in Italia.** [*Spongospora subterranea* in Italy.]—*Ann. Sper. agr.*, N.S., ii, 2, pp. 237–246, 1 col. pl., 4 figs., 1948. [English summary.]

An account is given of the macro- and microscopical features of the infection of potato tubers by *Spongospora subterranea* [*R.A.M.*, xxvi, pp. 78, 508; xxvii, p. 151] and of the life-cycle of the fungus. *S. subterranea* was first observed in Italy in 1932 [cf. ibid., xxiii, p. 80] on tubers from the upper Val Pusteria. Since then potatoes of numerous varieties in another locality of the Alto Adige and in the vicinity of Avezzano have shown symptoms resembling those of the disease. It is certain that the disease has been present south of the Alps for some time. It has now spread over a wide area from two main infection centres, Brunico in the north of Italy, and Avezzano in the centre; seed potatoes are grown on a large scale in both localities. The paper concludes with recommendations for control, with special reference to Italian conditions.

Miller (J. C.). **Three new varieties of Irish Potatoes.**—*Amer. Potato J.*, xxv, 3, pp. 89–91, 1948.

Of the three new potato varieties bred from Irish potatoes by the Lousiana Agricultural Experiment Station, De Sota (a cross between Triumph and Katahdin) is resistant, and La Salle (Chippewa × an inbred seedling of Triumph) highly resistant to mild mosaic [*R.A.M.*, xxvii, p. 85], while La Soda (from Triumph × Katahdin) shows some resistance to mosaic [ibid., xxvii, p. 86]. All three are medium early varieties.

Mattson (H.). **New Potato varieties introduced in 1947.**—*Amer. Potato J.*, xxv, 4, pp. 133–134, 1948.

The early-maturing potato varieties Essex and Snowdrift, the medium varieties Fillmore and Madison, and the late varieties Cortland, Glenmeer, and Harford, introduced by Dr. Reddick of Cornell University during 1947, are only slightly susceptible to late blight [*Phytophthora infestans*: *R.A.M.*, xxvii, p. 151 and next abstract] and may be suitable for areas where the disease is not a serious problem. In areas where blight is more severe they may need dusting or spraying, but during the latter part of the season only.

Pratt (A. J.). **Yield and grades of blight-resistant Potatoes grown in twenty different locations in New York State in 1947.**—*Amer. Potato J.*, xxv, 6, pp. 209–215, 1948.

The results of tests conducted in 1947 in 20 different localities in New York State with 17 potato varieties and seedlings resistant to blight [*Phytophthora infestans*: *R.A.M.*, xxvii, p. 34 and preceding abstract] showed that Essex (480 bush. per acre), DUA-11 (458), Ashworth (423), Placid (415), Virgil (402), DZE-10 (397), DUA-2 (392), and DUA-10 (320) considerably outyielded the standard

varieties Green Mountain (277), Katahdin (269), and Rural (213). At six locations blight killed both Rurals and Green Mountains so early that the yield did not exceed 50 bush. per acre. Essex, however, is highly susceptible to scab [*Actinomyces scabies*: ibid., xxvii, p. 85]. [This article is also published as *Pap. Dep. Veg. Crops, Cornell* 300.]

Hardenburg (E. V.). **Effect of sprayer wheel injury on the yield of Potatoes.**—*Amer. Potato J.*, xxv, 4, pp. 128–130, 1948.

In 1947, at Richford, New York, a replicated and randomized test was carried out to determine the extent to which potato yields are affected by sprayer-wheel injury and the differences in varietal susceptibility. By comparing the yields of the injured and uninjured replications of each of 24 varieties, it was shown that the yield reduction ranged from 10 per cent. for Virgil, a rank-growing variety resistant to blight [*Phytophthora infestans*] to 58·2 per cent. for Katahdin, an average-sized plant. Small, upright-growing varieties such as Warba and Cobbler showed a greater reduction in yield (34·9 and 32·8 per cent., respectively) than the average (29·2 per cent.) for all adversely affected varieties. It is concluded that under favourable conditions of high elevation, high soil fertility level, and ample rainfall for plant growth, vine injury caused by sprayer and tractor wheels may cause a widely varying reduction in yield. The few instances in which no yield reduction occurred may be due to experimental error, soil variability, or some other obscure influential factor. The extent of wheel injury does not appear to bear any significant relation to season of maturity or growth habit of the variety. In future, potato experiments, and particularly variety yield tests, should be so designed that the factor of sprayer-wheel injury can be either neutralized or taken into account in assessing the results.

Hansford (C. G.), Whelan (L. A.), & De Silva (C. A.). **Agricultural experiment work of Rubber Research Scheme—Introduction.**—*Quart. Circ. Ceylon Rubb. Res. Scheme*, xxiv, 3–4, pp. 3–26, 1 fig., 1949.

An alternative method to the usual one in Ceylon of felling old rubber trees by cutting the main roots and using elephants to pull down the trees consists in poisoning each tree with ½ lb. sodium arsenite. With neither this method nor that of spraying with diesel oil is it necessary to fell the trees, which are left to decay where they stand. With the elephant-clearing method experience has demonstrated that where the costs of the operation cannot be recovered from sales of firewood the remaining trunks with their large branches can be left to rot where they fall. It is an advantage to leave the trunks near their positions, as new sites of *Fomes lignosus* root disease [cf. *R.A.M.*, xxvi, p. 466] may arise on the old roots left in the soil. On several occasions these sites came to light through the growth of *F. lignosus* on the trunks of individual felled trees, and when excavated the old roots were found to be covered with the mycelium of the fungus. Where all old timber has been removed the first sign of *Fomes* root disease is the death of plants nine to eighteen months old; by this time the individual patches of disease are much larger than those detected at an earlier stage in fields where the old trees are left *in situ* to act as 'indicators'. The evidence shows that in old rubber fields there may often be quiescent infections of *F. lignosus* which are never discovered, even when the old stand is felled. The mycelium spreads underground over the dying roots and early discovery of the sites will, in consequence, reduce the cost of eradication. Poisoning the old stand with sodium arsenite will not affect infection, and the poisoned trees must be inspected repeatedly to see that all cases of infection are properly dealt with. However, there is very little danger of the infection sites increasing, as the fungus is probably unable to invade wood containing the poison, merely completing its development on wood already infected.

It is a considerable advantage to plant rubber trees as early as possible, preferably in April or May, so that, by the time attacks of *Phytophthora* [*P. palmivora* and *P. meadii*; ibid., xxiv, pp. 204, 385] occur in August, the young shoots may be as fully developed as possible. With stumps planted after July each year this trouble does not arise, as *Phytophthora* infection is comparatively rare in the north-east monsoon season.

Notes are given on 13 rubber clones planted in Ceylon, their suitability for different areas, general characters, yield, and susceptibility to various diseases.

De Silva (C. A.). **Yields of budded Rubber and clonal seedlings in commercial tapping.**—*Quart. Circ. Ceylon Rubb. Res. Scheme*, xxiv, 1–2, pp. 3–8, 1947.

In this report on the performance of imported rubber clones in Ceylon it is stated that the yields of T.J.16 were lower, on the whole, than those of T.J.1 and reports of its susceptibility to severe attacks of *Oidium* leaf disease [*O. heveae*: *R.A.M.*, xxvi, p. 262], resulting from its late wintering habit, continued to be received. BD 5 compares very favourably with T.J.1, but suffers from die-back of the young stems due to *Phytophthora* [*P. palmivora* and *P. meadii*: see preceding abstract]. Clone Glenshiel 1 has a high yield per tree, but two estates reported a fairly high percentage of brown bast [ibid., xxv, p. 183] before the end of the third tapping year; the author's experience is that after three years' tapping on 100 per cent. intensity the incidence of brown bast in this clone can be both sudden and serious. With careful tapping, however, along recommended lines this susceptibility to brown bast can be greatly diminished. Clone 86 appears to be less susceptible to *O. heveae* than T.J.1 and GL 1, and should prove suitable for most localities. The evidence shows that rubber seedlings are as susceptible to brown bast as budded plants.

Darpoux (H.). **Essais de traitement contre la rouille du Carthame.** [Spraying tests against Safflower rust.]—*C. R. Acad. Agric. Fr.*, xxxiv, 2, pp. 131–134, 1948.

The author's studies showed that *Puccinia carthami* [*R.A.M.*, xxvi, p. 214] overwinters mainly as the teleutospores on safflower seeds [cf. ibid., xxiv, p. 4]. In the spring these teleutospores, carried away on the seed, germinate soon after sowing, and the basidiospores infect the cotyledons of the young plants. A week later orange spots appear, consisting of spermogonia, and after two or three days primary uredospores develop round them. These infect the first leaves, thus setting up the first foci of infection. Later on secondary uredospores cause the spread of the disease, though they do not appear to be wind-borne to any great distance, healthy plants, in the author's experiments, 200 m. away from infected ones remaining unaffected throughout their growth. The teleutosori appear again at the end of summer.

Heavily infected safflower seeds were sown after soaking for 20 minutes in 2 per cent. Bordeaux mixture, in 0·5 per cent. copper sulphate, in 0·25 per cent. commercial formalin, or dusting with copper carbonate, a mixture of trioxymethylene (75 per cent.) and talc (25 per cent.), or an organic mercury product. The resulting amounts of infection were compared with those in the untreated controls and a coefficient of efficiency based on the comparison was calculated for each treatment. The figures obtained were, Bordeaux mixture 83 per cent. efficiency, copper sulphate solution 53, formalin nil, copper carbonate dust 100, trioxymethylene-talc dust 94, and the organic mercury dust 100.

Evans (H.). **Eighteenth Annual Report of the Sugarcane Research Station, Mauritius, 1947.**—53 pp., 1948.

In this report [cf. *R.A.M.*, xxvii, p. 386] it is stated that in Mauritius the M.171/30 sugar-cane variety is resistant to red rot [*Physalospora tucumanensis*: loc. cit.], but

shows some smut [*Ustilago scitaminea*: ibid., xxiii, p. 252; xxvi, p. 126]. M.134/32, which now occupies 80 per cent. of the total area of cane, suffered no severe attack of red rot during the year. Replacements due to pineapple disease [*Ceratostomella paradoxa*: ibid., xxvii, p. 386] on M.134/32 in the drier northern parts of the island have been obviated by the use of aretan [loc. cit.]. M.63/39 is highly resistant to *C. paradoxa*, M.165/38 and M.76/39 are susceptible but tolerant, and infected cuttings often produce healthy stools. Confirmation has been obtained that M.165/38, M.63/39, and M.76/39 are vigorous, high-yielding, and resistant to most diseases found locally except chlorotic streak, to which they are tolerant [ibid., xxvii, p. 157]. Cuttings infected with chlorotic streak frequently failed to grow.

By arrangement with the Station Agronomique, Réunion, information was made available on the behaviour there of the Mauritius Sugarcane Research Station seedlings in relation to mosaic disease in particular [cf. ibid., xxii, p. 327; xxvi, p. 126]. M.134/32, cultivated on a large scale in Réunion in areas normally affected with mosaic, has so far remained immune.

CRANDALL (B. S.) & JAVIER DIEGUEZ (C.). **A check list of the diseases of economic plants in the Tingo Maria zone of the Peruvian Montana.**—*Plant Dis. Reptr*, xxxii, 1, pp. 20–27, 1948. [Mimeographed.]

In this list of diseases of economic plants in the Tingo Maria zone, Peru, compiled by the Estación Central de Colonización, the following are of special interest: twig die-back (*Phyllachora balansiae* and *Pseudobeltrania cedrela*) of *Cedrela* sp., *Podonectria coccicola* on citrus scale insects [*R.A.M.*, xxvi, p. 335] (*Tetracium coccicola* being the conidial stage), coffee root rot (*Rosellinia bunodes*) [ibid., xx, p. 564], and tea scab (*Elsinoe leucospila*) [ibid., xxvi, p. 317].

SĂVULESCU (OLGA). **Studiul speciilor de Cystopus Lév. din Europa cu privire specială asupra speciilor din România.** [A study on the European species of the genus *Cystopus* Lév. with special reference to the species found in Rumania.]—Thesis 213, Univ. Bucarest, 106 pp., 25 figs., 73 graphs, 1946. [French summary. Received April, 1948.]

In this study of the European species of *Cystopus*, with special reference to those found in Rumania, the author retains the subsections *Aequales* and *Annulati* of Fischer. *C. candidus* [*R.A.M.*, xxv, pp. 88, 416; xxvi, p. 532] is very widespread and very polyphagous. It attacks, chiefly, members of the Lepidieae, Brassiceae, Hesperideae, Sisymbrieae, Euclidieae, Arabideae, Matthioleae, Drabeae, and Alysseae, but does not infect the more primitive tribes. Biometrical measurements of the conidia taken on all the hosts on which this fungus has been found in Rumania have led the author to make two varieties (1) var. *ellipsoideus* n. var., with ellipsoidal conidia measuring 18 by 15 μ, found on *Brassica nigra*, *Hesperis matrionalis*, and other hosts, and (2) var. *globosus* n. var. with spherical conidia 12 to 18 μ in diameter, of which there are three forms, (*a*) f. *macrosporus* n. f. with conidia 18 μ in diameter on wallflower and (*b*) f. *intermedius* n. f. with conidia 15 μ in diameter on rape, turnip, radish, and other hosts, and (*c*) f. *microsporus* n. f. with conidia 12 to 13 μ in diameter on *Alyssum alyssoides*, *Arabis* spp., and other hosts. The varieties and forms into which *C. candidus* is divided by the author do not correspond with the forms *macrospora* and *microspora* of Togashi and his co-workers [ibid., x, p. 556].

Inoculation experiments showed that *C. candidus* comprises the following forms specialized on certain hosts: (1) f. sp. *alyssi-alyssoidis*, (2) f. sp. *brassicae-nigrae* [ibid., xviii, p. 275], (3) f. sp. *capsellae-bursaepastoris*, (4) f. sp. *coronopi-procumbentis*, (5) f. sp. *hesperidis-matronalis*, (6) f. sp. *lepidii-perfoliati*, (7) f. sp. *sinapidis-arvensis*, and (8) f. sp. *cheiranthi-cheiri*. These forms belong to the different varieties and morphological forms differentiated by the author.

C. portulacae [ibid., xviii, p. 275] occurs in Rumania on *Portulaca oleracea*, while *C. lepigoni* is found in the same country on *Spergularia marginata*.

C. tragopogi (Pers.) Oudem. (*C. tragopogonis* Schroeter) [ibid., xxvi, pp. 356, 376] attacks mostly genera of the Cichorieae. Among the Tubuliflorae, representatives of the Inuleae, Cynareae, Anthemidiae, Heliantheae, and Senecioneae are parasitized. Two varieties were separated biometrically: (1) var. *cylindraceus* n. var., with cylindrical conidia measuring 18 to 24 by 15 to 21 μ; with three forms, (*a*) f. *major* n. f., with conidia 24 by 20 to 21 μ on *Cirsium lanceolatum* and *Scorzonera hispanica*, (*b*) f. *intermedius* n. f., with conidia 21 by 18 μ on *Centaurea scabiosa*, *C. orientalis*, and other hosts, and (*c*) f. *minor* n. f., with conidia 18 by 15 μ on *Filago arvensis* and other hosts; (2) var. *sphaero-cuboideus* n. var., with spherical-cubic conidia 15 to 18 μ in diameter; having two forms, (*a*) f. *major* n. f. with conidia 18 μ in diameter on *Tragopogon porrifolius* (salsify) and other hosts, and (*b*) f. *minor* n. f. with conidia 15 μ in diameter on *Inula salicina*. Experimental infections confirmed the existence of two form species of *C. tragopogi*: f. sp. *tragopogi* and f. sp. *xeranthemi-annui*, already separated by T. Săvulescu and T. Rayss [ibid., x, p. 131].

C. bliti [ibid., xv, p. 745; xxiv, p. 207] occurs in Rumania on *Amaranthus* spp. including *A. albus* and *A. retroflexus*. The species was separated biometrically into (1) var. *macrosporus* n. var., with conidia 18 by 15 μ on *A. albus*, *A. retroflexus*, and *A. silvestris*, and (2) var. *microsporus* n. var., with conidia 16 by 14 μ on *A. viridis*.

C. eurotiae, parasitic on *Eurotia ceratoides* and *Ceratocarpus arenarius*, has been found in eastern Russia and south-eastern Rumania, in the latter area only on *C. arenarius*.

Perucci (E.). **Il 'Resistente 142'.** [The variety 'Resistente 142'.]—*Tabacco*, li, 579, pp. 14–18, 1947; lii, 582, pp. 16–23, 1948. [Abs. in *Plant Breed. Abs.*, xviii, 2, p. 340, 1948.]

The Wisconsin tobacco variety Havana No. 142, resistant to [black] root rot [*Thielaviopsis basicola*: *R.A.M.*, xxv, p. 583; xxvi, p. 34; xxvii, p. 65] and known in Italy as Resistente 142, has proved well adapted to the more humid Italian conditions.

Langford (A. N.). **Autogenous necrosis in Tomatoes immune from Cladosporium fulvum Cooke.**—*Canad. J. Res.*, Sect. C, xxvi, 1, pp. 35–64, 1 pl., 1948.

Six-weeks-old tomato seedlings, derivatives of crosses between tomato (of all varieties tested) and *Lycopersicon pimpinellifolium*, and immune from races 1 to 4 of *Cladosporium fulvum* [*R.A.M.*, xvi, p. 571; xxvi, p. 8, 187] developed small, angular, yellowish to brown, necrotic spots near the tips of the lower leaves, accompanied by downward and inward bending of the petioles and leaflet stalks. The symptoms intensified, the spots enlarging and coalescing and the leaves drawing together beneath the rachis [cf. ibid., xxiv, p. 210]. Under favourable environmental conditions particularly in late spring and summer the necrosis progresses from the tip of the leaflet to its base and from distal to proximal leaflets, spreads upwards to the younger leaves, though the youngest growth is always normal at the start. The fruit of plants with severe necrosis is very small. Continued intense sunlight causes browning of the affected plants followed by shrivelling and death of the leaves. When a truss has been exposed to light, cortical necrosis of the pedicel develops which may spread to the main stem and the truss often presents a brown, killed appearance. The plant may die under field conditions. Susceptible plants are always non-necrotic. The severity of the necrosis varies widely according to environmental conditions, particularly with the season. Experimental evidence shows that the necrosis is autogenous and the Mendelian nature of its inheritance has been determined. Plants immune from races 1 to 4 of *C. fulvum* and therefore

possessing the dominant gene Cfp_1, governing this factor, are potentially necrotic if they are homozygous with respect to factor *ne* (necrotic) present in tomato, but are non-necrotic if homozygous or heterozygous with respect to the dominant allele, *Ne*, found in *L. pimpinellifolium*. The data indicate that *L. pimpinellifolium* possesses factors modifying the severity of the necrosis occurring in the presence of the gene combination Cfp_1,*ne*. It also seems probable that one or more factors closely associated with *H* (smooth stem) in *L. pimpinellifolium* may prevent the development of necrosis in immune plants homozygous for *ne*.

It is concluded that the necrosis is the visible expression of an incompatibility between Cfp_1 and a chromosome complex derived largely from *L. esculentum*. The effect of these results upon tomato breeding is discussed, particularly in view of the discovery of races of *C. fulvum* capable of infecting Vetomold [loc. cit.].

VASUDEVA (R. S.) & SAM RAJ (J.). **A leaf-curl disease of Tomato.**—*Phytopathology*, xxxviii, 5, pp. 364–369, 3 figs., 1948.

For several years tomatoes at Delhi and in other areas have shown a pronounced dwarfing and puckering of the leaves, vein clearing, excessive branching, and stunting of the plant associated with mild to severe mosaic symptoms and partial or complete sterility of the infected plants according to the stage at which infection took place. The disease caused serious losses in young crops. During the winter of 1947 over 90 per cent. of the plants in early sown experimental plots at New Delhi were infected. From 1943 to 1945 the disease attacked 60 tomato varieties on trial for resistance to virus diseases.

The white fly (*Bemisia gossypiperda*) was shown to be a vector of the disease; 30 to 100 per cent. of the plants on which these insects had been released developed typical symptoms within 15 to 25 days. The disease was further transmitted by grafting to healthy tomato the tobacco varieties White Burley, German Samsun, and Harrison's Special, the potato variety Craig's Defiance, *Datura stramonium*, and *Nicotiana sylvestris* and *N. glutinosa*. On *D. stramonium* the reaction was violent.

The symptoms on the different hosts indicate that several strains of the tobacco leaf curl virus [*R.A.M.*, xxiv, p. 292; xxvi, p. 82] are responsible for the tomato leaf curl disease and that both the mild and severe forms of the virus produce almost identical symptoms on tomato. The virulence of certain strains of the virus appeared to diminish during passage through tomato and when these strains were brought back to tobacco they were found to produce mild reactions. The strain of the tobacco leaf curl virus causing enations induced on tomato symptoms resembling the mild type of disease and the characteristic enations were absent.

PAVARI (A.) & DE PHILLIPPIS (A.). **La sperimentazione di specie forestali esotiche in Italia. Resultati del primo ventennio.** [Experiments with exotic species of forest trees in Italy. Results of the first twenty years.]—*Ann. Sper. agr.*, N.S., xxxviii, 646 pp., 1941. [Abs. in *Plant Breed. Abs.*, xviii, 2, p. 372, 1948.]

In this comprehensive monograph, which contains observations extending over 20 years, the importance of certain introduced exotic forest trees is stressed in solving some of the Italian silvicultural problems. Among the examples mentioned are a number of disease-resistant species, such as chestnut (*Castanea crenata*) resistant to *Phytophthora cambivora* [*R.A.M.*, xxvi, p. 229], elm (*Ulmus pumila*) to *Ceratostomella ulmi* [ibid., xxvi, p. 365], red oak [*Quercus*] to *Oidium* spp. [ibid., xxi, p. 266; xxii, p. 379], and Japanese larch to canker [*Dasyscypha willkommii*: ibid., xxiii, p. 50; xxvii, p. 456, and above, p, 503].

After a detailed survey of each genus the individual species are described with the results of tests obtained with them in Italy and the Italian dependencies, and the regions in Italy for which each of the recommended species is suited are enumerated.